



MATHS

BOOKS - DEEPTI MATHS (TELUGU ENGLISH)

DIFFERENTIATION

Eamcet Mathematics Ib

1. If $x = a\cos\theta$, $y = b\sin\theta$ then $\frac{dy}{dx} =$

A. $\frac{b}{a}\operatorname{cosec}\theta$

B. $\frac{-b}{a}\cot\theta.$

C. $\frac{b}{a}\coth\theta$

D. $\frac{-b}{\alpha}\tanh\theta$

Answer: B



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2. If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$ then $\frac{dy}{dx} =$

A. $\tan\theta$

B. $\cot\theta$

C. $\cot\frac{\theta}{2}$

D. $\tan\frac{\theta}{2}$

Answer: A



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3. $\left. \frac{d \tan^{-1}(1)}{dx \sqrt{x^2 - 1}} \right\} =$

A. $\frac{-1}{x\sqrt{x^2 - 1}}$

B. $\frac{1}{x\sqrt{x^2 - 1}}$

C. $\frac{-2}{x\sqrt{x^2 + 1}}$

D. $\frac{-2}{x\sqrt{x^2 + 1}}$

Answer: A



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4. The derivative of $\tan x$ w.r.t. $\sec x$ is

A. $\tan x$

B. $\operatorname{cosec} x$

C. $\cot x$

D. $\cos x$

Answer: B



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5. If $f(x) = \tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$, $g(x) = \cos^{-1}\left(\frac{1 - x^2}{1 + x^2}\right)$ and $0 < \alpha < \frac{1}{2}$, then

$$\lim_{x \rightarrow \alpha} \frac{f(x) - f(\alpha)}{g(x) - g(\alpha)}$$

A. $\frac{-2}{3}$

B. $\frac{-3}{2}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: D

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6. If $x = \exp\left[\tan^{-1}\left(\frac{y - x^2}{x^2}\right)\right]$ then $\frac{dy}{dx} =$

A. $2x\left[1 + \tan(\ln x) + \frac{1}{2}\sec^2(\ln x)\right]$

B. $\left[1 + \tan(\ln x) + \frac{1}{2} \sec^2(\ln x) \right]$

C. $2x \left[1 + \tan(\ln x) + \sec^2(\ln x) \right]$

D. 0

Answer: A



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7. If $f(x) = \sin(2x^2 - 2[x])$ for $0 < x < 1$, then $f\left(\frac{\sqrt{\pi}}{2}\right) =$

A. $-\frac{\sqrt{x}}{2}$

B. $-\sqrt{2}$

C. 0

D. $\frac{\sqrt{x}}{2}$

Answer: C



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8. If $xe^{xy} = y + \sin^2x$, then $\frac{dy}{dx} =$

A. 1

B. 2

C. $\frac{1}{2}$

D. 0

Answer: A



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9. If $f(x) = \sin(2x^2 - 2[x])$ for $0 < x < 1$, then $f\left(\frac{\sqrt{\pi}}{2}\right) =$

A. $-\frac{\sqrt{\pi}}{2}$

B. $-\sqrt{\pi}$

C. 0

D. $\frac{\sqrt{\pi}}{2}$

Answer: C



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10. If $xe^{xy} = y + \sin^2 x$, then at $x = 0$, $\frac{dy}{dx} =$

A. 1

B. 2

C. $\frac{1}{2}$

D. 0

Answer: A



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Exercise 1 A

$$1. \frac{d}{dx} \left\{ 3\sqrt[3]{x} - \frac{4}{\sqrt[4]{x}} \right\} =$$

A. $x^{-2/3} + x^{-5/4}$

B. $x^{-1/3} + x^{-5/4}$

C. $x^{-2/3} + x^{-3/4}$

D. $x^{-1/3} + x^{-3/4}$

Answer: A



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$$2. \frac{d}{dx} \left\{ \left(x + \frac{1}{x} \right)^3 \right\} =$$

A. $3x^2 + 3 - \frac{3}{x^2} - \frac{3}{x^4}$

$$\text{B. } 3x^2 - 3 + \frac{3}{x^2} - \frac{3}{x^4}$$

$$\text{C. } 3x^2 + 3 + \frac{3}{x^2} + \frac{3}{x^4}$$

$$\text{D. } 3x^2 + 3 - \frac{3}{x^2} + \frac{3}{x^4}$$

Answer: A

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$$3. \frac{d}{dx} \left\{ x^n + \frac{1}{x^n} \right\} =$$

$$\text{A. } nx^{n-1} + \frac{n}{x^{n-1}}$$

$$\text{B. } nx^{n+1} \frac{n}{x^{n+1}}$$

$$\text{C. } nx^{n+1} \frac{n}{n^{n+1}}$$

$$\text{D. } nx^{n-1} - \frac{n}{x^{n+1}}$$

Answer: D

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$$4. \frac{d}{dx} \left\{ \log \left(\frac{x^2}{e^x} \right) \right\} =$$

A. $\frac{2}{x} + 1$

B. $\frac{2}{x} - 1$

C. $-\frac{2}{x} + 1$

D. none

Answer: B



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$$5. \frac{d}{dx} \left\{ \log \left(\frac{x}{e^{\tan x}} \right) \right\} =$$

A. $\frac{1}{x} \sin^2 x$

B. $\frac{1}{x} - \sec^2 x$

C. $\frac{1}{x} - \cot^2 x$

D. $\frac{1}{x} \tan^2 x$

Answer: B

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6. If $f(x) = \begin{cases} \frac{x-1}{2x^2-7x+5} & \text{for } x \neq 1 \\ -\frac{1}{3} & \text{for } x = 1 \end{cases}$ then $f(1)$ is equal to

A. $-\frac{1}{9}$

B. $-\frac{2}{9}$

C. $-\frac{1}{3}$

D. $\frac{1}{3}$

Answer: B

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7. If $y = 2^{2^x}$, then $\frac{dy}{dx} =$

A. $y(\log_{10}2)^2$

B. $y(\log_e2)^2$

C. $y2^x(\log_e2)^2$

D. $y\log_e2$

Answer: C



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8. If $h(x) = e^{e^x}$ then $\frac{h'(x)}{h(x)}$

A. $h(x)$

B. $\frac{1}{h(x)}$

C. $(\log h(x))$

D. $-\log h(x)$

Answer: C



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9. If $y = 2^{ax}$ and $\frac{dy}{dx} = \log_2 256 a x = 1$, then $a =$

A. 0

B. 1

C. 2

D. 3

Answer: C



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10. $f(x) = \frac{1}{1 + \frac{1}{x}} g(x) = \frac{1}{1 + \frac{1}{f(x)}} \Rightarrow g'(2) =$

A. 1/5

B. 1/25

C. 5

D. 1/16

Answer: B



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11. The derivative of $\log |\sin x|$ w.r.t x is

A. $\sin x$

B. $\cos x$

C. $\tan x$

D. $\cot x$

Answer: D



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12. The derivative for $\log |\sec x|$ w.r.t x is

A. $\sin x$

B. $\cos x$

C. $\tan x$

D. $\cot x$

Answer: C



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13. The derivative of $\log_x a$ w.r.t x is

A. $\frac{\log a}{x(\log x)^2}$

B. $\frac{-(\log a)}{x(\log x)^2}$

C. $\frac{\log a}{x(\log x)}$

D. none

Answer: B



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14. The derivative of $\tan^3(5x - 3)$ w.r.t is

A. $15\tan^2(5x - 3)\sec^2(5x - 3)$

B. $15\tan^2(5x + 3)\sec^2(5x - 3)$

C. $15\tan^2(5x - 3)\sec^2(5x + 3)$

D. $15\tan^2(5x + 3)\sec^2(5x + 3)$

Answer: A



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15. The derivative of $\sec(a^x + x^n)^2$ w.r.t x is

A. $2(a^x + x^a)(a^x \log a + ax^{n-1})\sec(a^x + x^n)^2 \tan(a^x + x^n)^2$

B. $2(a^x - x^a)(a^x \log a + ax^{n-1})\sec(a^x - x^n)^2 \tan(a^x + x^n)^2$

C. $2(a^x + x^a)(a^x \log a - ax^{n-1})\sec(a^x + x^n) \tan(a^x - x^n)^2$

D. $2(a^x - x^a)(a^x \log a + ax^{n-1})\sec(a^x + x^n) \tan(a^x - x^n)^2$

Answer: A



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16. The derivative of $\log(x^2 + 1)$ w.r.t x is

A. $\frac{1}{\sqrt{x^2 + 1}}$

B. $\frac{2x}{x^2 + 1}$

C. $\frac{1}{\sqrt{x^2 - 1}}$

D. $\frac{2x}{x^2 - 1}$

Answer: B

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17. $\frac{d}{dx} \log \left(x + \sqrt{x^2 + 1} \right) \Big\} =$

A. $\frac{1}{1 + x^2}$

B. $\frac{1}{\sqrt{1 + x^2}}$

C. $\frac{-1}{\sqrt{x + x^2}}$

D. $\sqrt{1 + x^2}$

Answer: B

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18. The derivative of $\log \left(x + \sqrt{x^2 - 1} \right)$ w.r.t x is

A. $\frac{1}{\sqrt{x^2 + 1}}$

B. $\frac{2x}{x^2 + 1}$

C. $\frac{1}{\sqrt{x^2 - 1}}$

D. $\frac{2x}{x^2 - 1}$

Answer: C



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19. The derivative of $\log \left(x + \sqrt{x^2 + a^2} \right)$ w.r.t x is

A. $\frac{1}{\sqrt{x^2 + a^2}}$

B. $\frac{2x}{x^2 + a}$

C. $\frac{1}{\sqrt{x^2 - a^2}}$

$$D. \frac{2x}{x^2 - a}$$

Answer: A

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20. The derivative of $\left(x + \sqrt{x^2 + 1}\right)^n$ w.r.t x is

$$A. \frac{n\left(x + \sqrt{x^2 + 1}\right)^n}{\sqrt{x^2 + 1}}$$

$$B. \frac{n\left(x + \sqrt{x^2 - 1}\right)^n}{\sqrt{x^2 - 1}}$$

$$C. \frac{n\left(x - \sqrt{x^2 + 1}\right)^n}{\sqrt{x^2 + 1}}$$

$$D. \frac{n\left(x - \sqrt{x^2 + 1}\right)^n}{\sqrt{x^2 - 1}}$$

Answer: A

21. The derivative of $(x + \sqrt{x^2 - 1})^m$ w.r.t x is

A. $\frac{m(x + \sqrt{x^2 + 1})^m}{\sqrt{x^2 + 1}}$

B. $\frac{m(x + \sqrt{x^2 - 1})^m}{\sqrt{x^2 - 1}}$

C. $\frac{m(x - \sqrt{x^2 + 1})^m}{\sqrt{x^2 + 1}}$

D. $\frac{m(x - \sqrt{x^2 + 1})^m}{\sqrt{x^2 - 1}}$

Answer: B

22. The derivative of $\log [\log(\log x)]$ w.r.t x is

A. $\frac{1}{x \log x \log(\log x)}$

B. $\frac{1}{\log x \log(\log x)}$

C. $-\frac{1}{x \log x \log(\log x)}$

D. $-\frac{1}{\log x \log x(\log x)}$

Answer: A

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23. The derivative of $\log |\sec x + \tan x|$ w.r.t x is

A. $\sin x$

B. $\tan x$

C. $\sec x$

D. $\operatorname{cosec} x$

Answer: C

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24. The derivative of $\log |\operatorname{cosec} x - \cot x|$ w.r.t x is

A. $\sin x$

B. $\tan x$

C. $\sec x$

D. $\operatorname{cosec} x$

Answer: D

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25. $\frac{d}{dx} \left[\frac{x}{2} + \frac{1}{2} \log |\sin x + \cos x| \right] =$

A. $\frac{\tan x}{1 + \tan x}$

B. $\frac{1}{1 + \cos x}$

C. $\frac{1}{1 + \cot x}$

D. $\frac{1}{1 + \tan x}$

Answer: D

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26. If $y = x \log \left| x + \sqrt{1 + x^2} \right| - \sqrt{1 + x^2}$ then $\frac{dy}{dx} =$

A. $\log \left(x - \sqrt{1 + x^2} \right)$

B. $\frac{1}{2} \log \left(x + \sqrt{1 + x^2} \right)$

C. $\sinh^{-1} x$

D. none

Answer: C

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27. The derivative of $\sqrt{\tan\sqrt{x}}$ w.r.t x is

A. $\frac{\sin\sqrt{x}}{4\sqrt{x}\cos\sqrt{x}}$

B. $\frac{\sec^2\sqrt{x}}{4\sqrt{x}\tan\sqrt{x}}$

C. $\frac{-\sin\sqrt{x}}{4\sqrt{x}\cos\sqrt{x}}$

D. $\frac{-\sec^2\sqrt{x}}{4\sqrt{x}\tan\sqrt{x}}$

Answer: C



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28. The derivative of $\sqrt{\tan\sqrt{x}}$ w.r.t x is

A. $\frac{\sin\sqrt{x}}{4\sqrt{x}\cos\sqrt{x}}$

B. $\frac{\sec^2\sqrt{x}}{4\sqrt{x}\tan\sqrt{x}}$

C. $\frac{-\sin\sqrt{x}}{4\sqrt{x}\cos\sqrt{x}}$

$$D. \frac{-\sec^2\sqrt{x}}{4\sqrt{x}\tan\sqrt{x}}$$

Answer: B

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$$29. \frac{d}{dx} \left\{ \frac{1}{\sqrt{3x+2}} \right\} =$$

A. $\frac{3}{2(3x+2)^{3/2}}$

B. $-\frac{3}{2(3x+2)^{3/2}}$

C. $\frac{3}{2(3x-2)^{3/2}}$

D. $-\frac{3}{2(3x-2)^{3/2}}$

Answer: B

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30. If $y = \sqrt{ax} + \frac{a^2}{\sqrt{ax}}$ then y_1, y_2 at $x = a$ are

A. a

B. 0

C. 1

D. -1

Answer: B



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31. The derivative of $\sqrt{\sin x + \sqrt{\sin x}}$ w.r.t x is

A. $-\frac{\cos x (1 + 2\sqrt{\sin x})}{4\sqrt{\sin^2 x + \sin x} \sqrt{\sin x}}$

B. $-\frac{\cos x (1 + 2\sqrt{\sin x})}{4\sqrt{\sin^2 x - \sin x} \sqrt{\sin x}}$

$$C. \frac{\cos x (1 - 2\sqrt{\sin x})}{4\sqrt{\sin^2 + \sin x}\sqrt{\sin x}}$$

$$D. \frac{\cos x (1 - 2\sqrt{\sin x})}{4\sqrt{\sin^2 - \sin x}\sqrt{\sin x}}$$

Answer: A

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32. The derivative of $\sqrt{\tan x} + \sqrt{\tan x}$ w.r.t x is

$$A. \frac{\sec^2 x [1 + 2\sqrt{\tan x}]}{4\sqrt{\tan^2 x + \tan x}\sqrt{\tan x}}$$

$$B. \frac{\sec^2 x [1 - 2\sqrt{\tan x}]}{4\sqrt{\tan^2 x + \tan x}\sqrt{\tan x}}$$

$$C. \frac{\sec x [1 + 2\sqrt{\tan x}]}{4\sqrt{\tan^2 x + \tan x}\sqrt{\tan x}}$$

$$D. \frac{\sec x [1 - 2\sqrt{\tan x}]}{4\sqrt{\tan^2 x + \tan x}\sqrt{\tan x}}$$

Answer: A



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33. $\frac{d}{dx} \left\{ \log \left(\sqrt{\operatorname{cosec} x + 1} - \sqrt{\operatorname{cosec} x - 1} \right) \right\} =$

A. $\operatorname{cosec} x$

B. $2\operatorname{cosec} x$

C. $\frac{1}{2}\operatorname{cosec} x$

D. $\cot x$

Answer: C



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34. The derivative of $(x^2 + 1)^5(2x + 3)^3$ w.r.t x is

A. $6(x^2 + 1)^5(2x + 3)^2 + 10x(x^2 + 1)^4(2x + 3)^3$

B. $6(x^2 - 1)^5(2x + 3)^2 + 10x(x^2 + 1)^4(2x + 3)^3$

C. $6(x^2 + 1)^5(2x - 3)^2 + 10x(x^2 + 1)^4(2x - 3)^3$

D. $6(x^2 - 1)^5(2x + 3)^2 + 10x(x^2 + 1)(2x - 3)^3$

Answer: A

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35. The derivative of $\sin mx \cos nx$ w.r.t x is

A. $m \cos mx \cos nx + n \sin mx \sin nx$

B. $m \cos mx \cos nx - n \sin mx \sin nx$

C. $m \sin mx \cos nx + n \sin mx \cos nx$

D. $m \sin mx \cos nx - n \sin mx \cos nx$

Answer: B

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36. The derivative of $x\sqrt{\sin x}$ w.r.t x is

A. $\frac{2\sin x + x\cos x}{2\sqrt{\sin x}}$

B. $\frac{2\sin x - x\cos x}{2\sqrt{\sin x}}$

C. $\frac{2\cos x + x\sin x}{2\sqrt{\sin x}}$

D. $\frac{2\cos x - x\sin x}{2\sqrt{\sin x}}$

Answer: A



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37. The derivative of $x^2\cos^3 2x$ w.r.t x is

A. $2x\sin^2 2x(\cos 2x - 3x\sin 2x)$

B. $2x\sin^2 2x(\cos 2x + 3x\sin 2x)$

C. $2x\cos^2 2x(\cos 2x - 3x\sin 2x)$

D. $2x\cos^2 2x(\cos 2x + 3x\sin 2x)$

Answer: C

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38. $\frac{d}{dx} \left\{ e^{ax} \sin(bx + c) \right\} =$

A. $e^{ax} [a \sin(bx + c) + b \cos(bx + c)]$

B. $e^{ax} [a \cos(bx + c) + b \sin(bx + c)]$

C. $e^{ax} [a \sin(bx + c) - b \cos(bx + c)]$

D. $e^{ax} [a \cos(bx + c) - b \sin(bx + c)]$

Answer: A

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39. The derivative of $e^{ax} \cos(bx + c)$ w.r.t x is

A. $e^{ax} [a \cos(bx + c) + b \sin(bx + c)]$

B. $e^{ax}[\operatorname{acos}(bx + c) - b\sin(bx + c)]$

C. $e^{ax}[\operatorname{acos}(bx + c) - b\sin(bx - c)]$

D. $e^{ax}[\operatorname{acos}(bx - c) + b\sin(bx + c)]$

Answer: B

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40. The derivative of $\sin^5 3x \cos^3 2x$ w.r.t x is

A. $3\sin^4 \cos^2 2x(5\cos 2x \cos 3x - 2\sin 3x \sin 2x)$

B. $3\sin^4 3x \cos^2 2x(5\cos 2x \cos 3x + 2\sin 3x \sin 2x)$

C. $3\cos^2 5x \sin 3x(5\cos 3x \cos 5x + 2\sin 5x \sin 3x)$

D. $3\cos^2 5x \sin 3x(5\cos 3x \cos 5x - 2\sin 5x \sin 3x)$

Answer: A

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$$41. \frac{d}{dx} \left\{ \frac{(2x^2 - 3x + 5)^2}{(5x - 2)^3} \right\} =$$

$$A. \frac{(2x^2 + 3x + 5)(1 - x^2 - x - 63)}{(5x - 2)^4}$$

$$B. \frac{(2x^2 - 3x + 5)(10x^2 + x - 63)}{(5x - 2)^4}$$

$$C. \frac{(2x^2 + 3x + 5)(10x^2 + x - 63)}{(5x - 2)^4}$$

$$D. \frac{(2x^2 - 3x + 5)(10x^2 - x - 63)}{(5x - 2)^4}$$

Answer: D



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$$42. \frac{d}{dx} \left\{ \frac{1 - \cos 2x}{3 + 2\sin 2x} \right\} =$$

$$A. \frac{2(2 + 3\sin 2x + 2\cos 2x)}{(3 + 2\sin 2x)^2}$$

- B. $\frac{2(2 + 3\sin 2x - 2\cos 2x)}{(3 + 2\sin 2x)^2}$
- C. $\frac{2(2 - 3\sin 2x + 2\cos 2x)}{(3 + 2\sin 2x)^2}$
- D. $\frac{2(2 - 3\sin 2x - 2\cos 2x)}{(3 + 2\sin 2x)^2}$

Answer: B

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43. $\frac{d}{dx} \left\{ \tan^2 \left(\frac{1+x}{1-x} \right) \right\} =$

- A. $\frac{4}{(1+x)^2} \tan \left(\frac{1+x}{1-x} \right) \sec^2 \left(\frac{1+x}{1-x} \right)$
- B. $\frac{4}{(1-x)^2} \tan \left(\frac{1+x}{1-x} \right) \sec^2 \left(\frac{1+x}{1-x} \right)$
- C. $\frac{4}{(1+x)^2} \tan \left(\frac{1+x}{1-x} \right) \sec \left(\frac{1+x}{1-x} \right)$
- D. $\frac{4}{(1-x)^2} \tan^2 \left(\frac{1+x}{1-x} \right) \sec \left(\frac{1+x}{1-x} \right)$

Answer: B

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$$44. \frac{d}{dx} \left\{ \cos \left(\frac{1-x^2}{1+x^2} \right) \right\} =$$

$$\text{A. } \frac{4x}{(1+x^2)^2} \sin \left(\frac{1-x^2}{1+x^2} \right)$$

$$\text{B. } \frac{4x}{(1-x^2)^2} \sin \left(\frac{1-x^2}{1+x^2} \right)$$

$$\text{C. } -\frac{4x}{(1+x^2)^2} \sin \left(\frac{1-x^2}{1+x^2} \right)$$

$$\text{D. } \frac{4x}{(1-x^2)^2} \sin^2 \left(\frac{1-x^2}{1+x^2} \right)$$

Answer: A



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$$45. \frac{d}{dx} \left\{ \sin^2 \left(\frac{1-x^2}{1+x^2} \right) \right\} =$$

$$A. \frac{4x}{(1+x^2)^2} \sin 2 \left(\frac{1-x^2}{1+x^2} \right)$$

$$B. \frac{4x}{(1-x^2)^2} \sin \left(\frac{1-x^2}{1+x^2} \right)$$

$$C. \frac{-4x}{(1-x^2)^2} \sin 2 \left(\frac{1-x^2}{1+x^2} \right)$$

$$D. \frac{4x}{(1-x^2)^2} \sin^2 \left(\frac{1-x^2}{1+x^2} \right)$$

Answer: C

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$$46. \frac{d}{dx} \left\{ \sqrt{\frac{1+x^2}{1-x^2}} \right\} =$$

$$\text{A. } \frac{2x}{(1+x^2)\sqrt{1-x^4}}$$

$$\text{B. } \frac{2x}{(1-x^2)\sqrt{1+x^4}}$$

$$\text{C. } \frac{2x}{(1+x^2)\sqrt{1+x^4}}$$

$$\text{D. } \frac{2x}{(1-x^2)\sqrt{1-x^4}}$$

Answer: D



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$$47. \frac{d}{dx} \left\{ \sqrt{\frac{1-\cos x}{1+\cos x}} \right\} =$$



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$$48. \frac{d}{dx} \left\{ \sqrt{\frac{1+\sin x}{1-\sin x}} \right\} =$$

A. $\frac{1}{1 + \sin x}$

B. $\frac{1}{1 - \sin x}$

C. $\frac{1}{1 + \cos x}$

D. $\frac{1}{1 - \cos x}$

Answer: B

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49. $\frac{d}{dx} \left\{ \frac{\sin x + \cos x}{\sqrt{1 + \sin 2x}} \right\} =$

A. 0

B. 1

C. 2

D. 3

Answer: A



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$$50. \frac{d}{dx} \left\{ \frac{\sqrt{a^2 + x^2} + \sqrt{a^2 - x^2}}{\sqrt{a^2 + x^2} - \sqrt{a^2 - x^2}} \right\} =$$

$$\text{A. } \frac{2a^2}{x^2} \left\{ 1 + \frac{a^2}{\sqrt{a^4 - x^4}} \right\}$$

$$\text{B. } \frac{2a^2}{x^3} \left\{ 1 + \frac{a^2}{\sqrt{a^4 - x^4}} \right\}$$

$$\text{C. } 1 + \frac{a^2}{\sqrt{a^4 - x^4}}$$

$$\text{D. } 1 - \frac{a^2}{\sqrt{a^4 - x^4}}$$

Answer: B



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$$51. \frac{d}{dx} \left\{ \frac{\log(\sqrt{1+x} + \sqrt{1-x})}{\sqrt{1+x} - \sqrt{1-x}} \right\} =$$

A. $\frac{1}{x\sqrt{1-x^2}}$

B. $\frac{-1}{\sqrt{1-x^2}}$

C. $\frac{-1}{x\sqrt{1-x^2}}$

D. none

Answer: D

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52. $\frac{d}{dx} \left\{ \log \left(\frac{\sqrt{x+1}-1}{\sqrt{x+1}+1} \right) + \frac{\sqrt{x}}{\sqrt{x+1}} \right\} =$

A. $\frac{1}{x\sqrt{x+1}} + \frac{1}{2\sqrt{x}\sqrt{x+1}(x+1)}$

B. $\frac{1}{x\sqrt{x+1}} - \frac{2x+1}{2\sqrt{x}\sqrt{x+1}}$

C. $x\sqrt{x+1} - 2\sqrt{x}\sqrt{x+1}(x+1)$

D. none

Answer: A



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$$53. \frac{d}{dx} \left\{ a \log \left(\frac{a + \sqrt{a^2 - x^2}}{x} \right) - \sqrt{a^2 - x^2} \right\} =$$

A. $\frac{\sqrt{a^2 - x^2}}{x}$

B. $\frac{-\sqrt{a^2 - x^2}}{x}$

C. $\frac{\sqrt{a^2 + x^2}}{x}$

D. $\frac{-\sqrt{a^2 + x^2}}{x}$

Answer: B



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$$54. \frac{d}{dx} \left\{ \log \left(\frac{\sqrt{x+a} + \sqrt{x-a}}{\sqrt{x-b} - \sqrt{x-c}} \right) \right\} =$$

$$A. \frac{1}{2} \left\{ \frac{1}{\sqrt{x^2 - a^2}} + \frac{1}{\sqrt{(x-b)(x-c)}} \right\}$$

$$B. \left\{ \frac{1}{\sqrt{x^2 - a^2}} + \frac{1}{(x-b)} \right\}$$

$$C. \left\{ \frac{1}{\sqrt{x^2 - a^2}} - \frac{1}{\sqrt{(x-b)(x-c)}} \right\}$$

$$D. \frac{1}{2} \left\{ \frac{1}{\sqrt{x^2 - a^2}} - \frac{1}{\sqrt{(x-b)(x-c)}} \right\}$$

Answer: A



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$$55. \text{ If } y = \log_{\cos x} \sin x, \text{ then, } \frac{dy}{dx} =$$

$$A. (\cot x \log \cos x + \tan x \log \sin x) / (\log \cos x)^2$$

B. $(\tan x \log \cos x + \cot x \log \sin x) / (\log \cos x)^2$

C. $(\cot x \log \cos x + \tan x \log \sin x) / (\log \sin x)^2$

D. none

Answer: A

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56. If $f(x) = x - x^2 + x^3 - x^4 + \dots \infty$, $|x| < 1$, then $f'(x) =$

A. $\frac{1}{1+x}$

B. $\frac{1}{(1+x)^2}$

C. $\frac{1}{1-x}$

D. $\frac{1}{(1-x)^2}$

Answer: B

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$$57. \frac{d}{dx} \left\{ (x+a)(x^2+a^2)(x^4+a^4)(x^8+a^8) \right\} =$$

$$A. \frac{15x^{16} - 16x^{15}a + a^{16}}{(x-a)^2}$$

$$B. \frac{x^{16} - x^{15}a + a^{16}}{(x-a)^2}$$

$$C. \frac{x^{16} - x^{16}}{x-a}$$

D. none

Answer: D



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58.

$$\frac{d}{dx} \left[(x+1)(x^2+1)(x^4+1)(x^8+1) \right] = (15x^p - 16x^q + 1)(x-1)^{-2} \Rightarrow (p, q) =$$

A. (12, 11)

B. (15, 14)

C. (16, 14)

D. (16, 15)

Answer: D



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59. If $y = (1 + x)(1 + x^2) \dots (1 + x^{2n})$, then $\left(\frac{dy}{dx}\right)_{x=0}$ is equal to

A. 0

B. $\frac{1}{2}$

C. 1

D. 2

Answer: C



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60. If $y = \log_a x + \log_x a + \log_x x + \log_a a$ then $\frac{dy}{dx} =$

A. $\frac{1}{x} + x \log a$

B. $\frac{\log a}{x} + \frac{x}{\log a}$

C. $\frac{1}{x \log a} + \log a$

D. $\frac{1}{x \log a} - \frac{\log a}{x(\log x)^2}$

Answer: D



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61. $f(x) = \log \left(e^x \left(\frac{x-2}{x+2} \right)^{3/4} \right) \Rightarrow f'(0) =$

A. $1/4$

B. 4

C. $-3/4$

D. 1

Answer: A



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62. If $y = 1 + \frac{x^2}{2!} + \dots$ then $\frac{dy}{dx} =$

A. e^x

B. $1/1 + x$

C. $\cos x$

D. none

Answer: A



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63. For $|x| < 1$ if $1 + x + x^2 \dots$ then $\frac{dy}{dx} =$

A. $\frac{1}{1-x}$

B. $\frac{-1}{(1-x)^2}$

C. $\frac{1}{(1-x)^2}$

D. none

Answer: C

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64. If $|x| < 1$ then $\frac{d}{dx}(1 - 2x + 3x^2 + \dots) =$

A. $\frac{1}{(1+x)^2}$

B. $\frac{2}{(1+x)^3}$

C. $\frac{-2}{(1+x)^3}$

D. none

Answer: C





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65. If $|x| < 1$ then $\frac{d}{dx} (1 + 2x + 3x^2 + \dots) =$

A. $\frac{1}{(1-x)^2}$

B. $\frac{2}{(1-x)^3}$

C. $\frac{-2}{(1-x)^3}$

D. $\frac{1}{(1-x)^2}$

Answer: B



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66. If $|x| < 1$ then

$$\frac{d}{dx} \left[1 + \frac{px}{q} + \frac{p(p+q)}{2!} \left(\frac{x}{q}\right)^2 + \frac{p(p+q)(p+2q)}{3!} \left(\frac{x}{q}\right)^3 + \dots \right] =$$

A. $p/q \cdot 1/(1-x)^{p/q+1}$

B. $(p/q)1/(1-x)^{p/q}$

C. $(1-x)^{p/q-1}$

D. none

Answer: A

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67. If $y = \exp \left\{ \sin^2 + \sin^4 x + \sin^6 x + \dots \right\}$ then $\frac{dy}{dx} =$

A. $e^{\tan^2 x}$

B. $e^{\tan^2 x \sec^2 x}$

C. $2e^{\tan^2 x} \tan x \sec^2 x$

D. none

Answer: C

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$$68. \frac{d}{dx} \left[x + \frac{x^3}{3} + \frac{x^5}{5} + \dots \right] =$$

$$A. \frac{d}{dx} \left[x + \frac{x^3}{3} + \frac{x^5}{5} + \dots \right] =$$

$$B. \frac{1}{x^2 - 1}$$

$$C. \frac{2}{1 - x^2}$$

$$D. \frac{1}{1 - x^2}$$

Answer: A



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$$69. \frac{d}{dx} \{ \cos x^0 \} =$$

$$A. -\sin x^0$$

$$B. -\frac{\pi}{180} \sin x^0$$

$$C. \frac{\pi}{180} \sin x^0$$

D. $\frac{2\pi}{180} \sin^0$

Answer: B



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70. The derivative of $\sin^{-1}2x$ w.r.t x is

A. $\frac{2}{4+x^2}$

B. $-\frac{2}{1+4x^2}$

C. $\frac{2}{\sqrt{1-4x^2}}$

D. $-\frac{3}{\sqrt{1-9x^2}}$

Answer: C



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71. The derivative of $\sec^{-1}5x$ w.r.t x is

A. $\frac{1}{|x|\sqrt{25x^2 - 1}}$

B. $-\frac{3}{|x|\sqrt{x^2 - 9}}$

C. $-\frac{1}{2\sqrt{x - x^2}}$

D. $2x$

Answer: A



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72. The derivative of $\tan^{-1}(x/2)$ w.r.t x is

A. $\frac{2}{4 + x^2}$

B. $-\frac{2}{1 + 4x^2}$

C. $\frac{2}{\sqrt{1 - 4x^2}}$

$$D. -\frac{3}{\sqrt{1-9x^2}}$$

Answer: A



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73. The derivative of $\operatorname{cosec}^{-1}(x/3)$ w.r.t is

$$A. \frac{1}{|x|\sqrt{25x^2-1}}$$

$$B. -\frac{3}{|x|\sqrt{x^2-9}}$$

$$C. -\frac{1}{2\sqrt{x-x^2}}$$

$$D. 2x$$

Answer: B



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74. The derivative of $\sin^{-1}\sin(x^2 - 2)$ w.r.t x is

A. $\frac{1}{|x|\sqrt{25x^2 - 1}}$

B. $-\frac{3}{|x|\sqrt{x^2 - 9}}$

C. $-\frac{1}{2\sqrt{x - x^2}}$

D. $2x$

Answer: D



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75. The derivative of $\sin^{-1}\cos x$ w.r.t x is

A. 0

B. 1

C. -1

D. 2

Answer: C



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76. If $y = \cot^{-1} \left[\tan \left(\frac{\pi}{2} - x \right) \right]$ then $\frac{dy}{dx} =$

A. x

B. 1

C. $\frac{1}{1+x^2}$

D. $\frac{-1}{1+x^2}$

Answer: B



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77. $\frac{d}{dy} \left\{ \cos \left[2 \sin^{-1}(\cos x) \right] \right\} =$

A. $2 \sin 2x$

B. $3 \cos 2x$

C. 0

D. none

Answer: A



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78. If $y = \sec(\tan^{-1}x)$, then $\frac{dy}{dx} \text{ at } x = 1$ is equal to

A. 1

B. $\sqrt{2}$

C. $\frac{1}{\sqrt{2}}$

D. $\frac{1}{2}$

Answer: A



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79. $\frac{d}{dx} \left\{ \sec^{-1} e^x \right\} =$

A. $\frac{1}{\sqrt{e^{2x} - 1}}$

B. $\frac{1}{e^x \sqrt{e^{2x} - 1}}$

C. $\frac{1}{e^x \sqrt{e^x - 1}}$

D. $\frac{e^x}{\sqrt{e^{2x} - 1}}$

Answer: A



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80. The derivative of $\cos h x/2$ w.r.t x is

A. $2\operatorname{sech}^2 2x$

B. $\cosh 3x$

C. $\frac{1}{2} \sinh \frac{x}{2}$

D. $-5\operatorname{cosech}^2 5x$

Answer: C



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81. The derivative of $\tanh^{-1} 2x$ w.r.t x is

A. $\frac{1}{\sqrt{4+x^2}}$

B. $\frac{5}{1-25x^2}$

C. $\frac{1}{\sqrt{x^2-9}}$

D. $\frac{2}{1-4x^2}$

Answer: D

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82. The derivative of $\text{sech}^{-1}3x$ w.r.t x is

A. $\frac{1}{x\sqrt{1-9x^2}}$

B. $-\frac{1}{x\sqrt{1-9x^2}}$

C. $\frac{1}{\sqrt{x^2-9}}$

D. $-\frac{1}{\sqrt{x^2-9}}$

Answer: B

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83. The derivative of $\sinh^{-1}x/2$ w.r.t x is

A. $\frac{1}{\sqrt{4+x^2}}$

B. $\frac{5}{1-25x^2}$

C. $\frac{1}{\sqrt{x^2 - 9}}$

D. $\frac{2}{1 - 4x^2}$

Answer: A

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84. The derivative of $\cos^{-1}\sqrt{x}$ w.r.t x is

A. $\frac{-1}{\sqrt{1 - x^2}}$

B. $\frac{1}{2(1 + x)\sqrt{x}}$

C. $\frac{-1}{2\sqrt{x - x^2}}$

D. $\frac{-1}{x[1 + (\log|x|)^2]}$

Answer: C

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85. If $f(x) = e^x$, $g(x) = \sin^{-1}x$ and $h(x) = f(g(x))$, then $\frac{h'(x)}{h(x)} =$

A. $\sin^{-1}x$

B. $\frac{1}{\sqrt{1-x^2}}$

C. $\frac{1}{1-x^2}$

D. $e^{\sin^{-1}x}$

Answer: B



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86. The derivative of $\tan^{-1}\sqrt{x}$ w.r.t x is

A. $\frac{-1}{\sqrt{1-x^2}}$

B. $\frac{1}{2(1+x)\sqrt{x}}$

C. $\frac{-1}{2\sqrt{x-x^2}}$

D. $\frac{-1}{2\sqrt{1-x^2}}$

Answer: B

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87. If $y = x^3 \sin^{-1}x + (x^2 + 2)\sqrt{1-x^2}$, then $dy/dx =$

A. $\sin^{-1}x$

B. $x^2 \sin^{-1}x$

C. $3x^2 \sin^{-1}x$

D. $9x^2 \sin^{-1}x$

Answer: D

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$$88. \frac{d}{dx} \left\{ \tan \left(\log \tan^{-1} \sqrt{x} \right) \right\} =$$

$$A. \frac{\sec^2 \log \tan^{-1} \sqrt{x}}{2(1+x)\sqrt{x} \tan^{-1} \sqrt{x}}$$

$$B. \frac{\sec^2 \left(\tan^{-1} \sqrt{x} \right)}{2(1+x) \tan^{-1} \sqrt{x}}$$

$$C. \frac{\sec^2 \left(\tan^{-1} \sqrt{x} \right)}{\sqrt{x} \tan^{-1} \sqrt{x}}$$

$$D. \frac{\sec^2(\log x)}{\sqrt{x} \tan^{-1} \sqrt{x}}$$

Answer: A



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$$89. \frac{d}{d\theta} \{ \sinh[\log \cot(\pi/4 + \theta)] \} =$$

$$A. -\tan 2\theta$$

$$B. -2\sec^2 2\theta$$

$$C. 2\sec^2 2\theta$$

D. none

Answer: B



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90. If $\sinh^{-1}x + \sinh^{-1}y = 1$ then

A. $\frac{dy}{dx} = \sqrt{\left| \frac{1+y^2}{1+x^2} \right|}$

B. $\frac{dy}{dx} + \sqrt{\left| \frac{1+y^2}{1+x^2} \right|}$

C. $\sqrt{1+y^2}y_1 + \sqrt{1+x^2} = 0$

D. none

Answer: B



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91. If $y = \sqrt{\left| \frac{1 - \sin^{-1}x}{1 + \sin^{-1}x} \right|}$ then $y'(0) =$

- A. 0
- B. 1
- C. -1
- D. none

Answer: C

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92. $\frac{d}{dx} \left\{ \cos^2 \left[\tan^{-1} \left(\operatorname{cosec}^{-1} \right) \right] \right\} =$

- A. $\frac{2}{(x^2 + 2)}$
- B. $\frac{2x}{(x^2 + 2)^2}$

C. $\frac{x^2 + 1}{x^2 + 2}$

D. none

Answer: B



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93. The derivative of $\operatorname{cosec}^{-1}(a^x)$ w. r. t x is

A. $\frac{\log a}{\sqrt{a^{2x} - 1}}$

B. $\frac{-\log a}{\sqrt{a^{2x} - 1}}$

C. $\frac{\log a}{\sqrt{a^{2x} + 1}}$

D. $\frac{-\log a}{\sqrt{a^{2x} + 1}}$

Answer: B



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$$94. \frac{d}{dx} \left\{ \cot^{-1} \left(\frac{1+x}{1-x} \right) \right\} =$$

A. $\frac{-1}{\sqrt{1+x^2}}$

B. $\frac{-\log a}{\sqrt{1-x^2}}$

C. $\frac{1}{1-x^2}$

D. $\frac{-1}{1+x^2}$

Answer: D



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$$95. \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{1+x}{1-x} \right) \right\} =$$

A. $\frac{1}{1+x^2}$

B. $\frac{1}{\sqrt{1+x^2}}$

C. $\frac{1}{\sqrt{1-x^2}}$

D. $\frac{1}{1-x^2}$

Answer: A

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96. The derivative of $\sqrt{\tan^{-1}x}$ w.r.t x is

A. $\frac{1}{2(1+x^2)\sqrt{\tan^{-1}x}}$

B. $\frac{1}{2(1-x^2)\sqrt{\tan^{-1}x}}$

C. $\frac{1}{2(1+x^2)\tan^{-1}x}$

D. $\frac{1}{2(1-x^2)\tan^{-1}x}$

Answer: A

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97. The derivative of $\sqrt{\tan^{-1}(e^x)}$ w.r.t x is

A. $\frac{e^x}{2(1 + e^{2x})\sqrt{\tan^{-1}e^x}}$

B. $\frac{e^x}{2(1 - e^{2x})\sqrt{\tan^{-1}e^x}}$

C. $\frac{e^x}{2(1 + e^x)\sqrt{\tan^{-1}e^x}}$

D. $\frac{e^x}{2(1 - e^x)\sqrt{\tan^{-1}e^x}}$

Answer: A



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98. The derivative of $\log_{10}[\sin^{-1}(x^2)]$ w.r.t x is

A. $\frac{2x}{\log_{10}\sin^{-1}x^2\sqrt{1 + x^4}}$

B. $\frac{2x}{\log_{10}\sin^{-1}x^2\sqrt{1 - x^4}}$

$$C. - \frac{2x}{\log_{10} \sin^{-1} x^2 \sqrt{1+x^4}}$$

$$D. - \frac{2x}{\log_{10} \sin^{-1} x^2 \sqrt{1-x^4}}$$

Answer: B

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99. If $y = \sin^{-1} \left(x^2 - \frac{1}{2} \right)$ then $\frac{dy}{dx} \text{ at } x = 0$ is

A. 0

B. 1

C. -1

D. 2

Answer: A

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$$100. \frac{d}{dx} \left\{ \cos^{-1} \left(\frac{a + b \cos x}{a \cos x + b} \right) \right\} (a < b) =$$

$$A. \frac{ab \sec^2 x}{a^2 + b^2 \tan^2 x}$$

$$B. \frac{ab \sec^2 x}{a^2 - b^2 \tan^2 x}$$

$$C. \frac{\sqrt{b^2 - a^2}}{a \cos x + b}$$

$$D. \frac{\sqrt{b^2 + a^2}}{a \cos x + b}$$

Answer: C



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$$101. \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{b \tan x}{a} \right) \right\} =$$

$$A. \frac{ab \sec^2 x}{a^2 + b^2 \tan^2 x}$$

$$B. \frac{ab \sec^2 x}{a^2 - b^2 \tan^2 x}$$

$$\sqrt{b^2 - a^2}$$

C. $\frac{\sqrt{b^2 - a^2}}{a \cos x + b}$

$$\sqrt{b^2 + a^2}$$

D. $\frac{\sqrt{b^2 + a^2}}{a \cos x + b}$

Answer: A



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102. $\frac{d}{dx} \left\{ \tan^{-1} \left(\sqrt{\left| \frac{a-b}{a+b} \right| \tan \frac{x}{2}} \right) \right\} =$

A. $\frac{\sqrt{a^2 - b^2}}{2(a + b \cos x)}$

B. $\frac{\sqrt{a^2 - b^2}}{a + b + \cos x}$

C. $\frac{1}{a + b \cos x}$

D. none

Answer: A



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$$103. \left\{ \tan^{-1} \left(\frac{a + b \cos x}{b + a \cos x} \right) \right\} =$$

- A. $\frac{(a^2 - b^2) \sin x}{(a^2 + b^2)(1 + \cos^2 x) + 4ab \cos x \sin x}$
- B. $\frac{\sin x}{(a^2 + b^2) \cos^2 x}$
- C. $\frac{\sin x}{(1 + \cos^2 x) + 4ab \cos x}$
- D. none

Answer: A



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$$104. \frac{d}{dx} \left\{ \frac{2}{\sqrt{a^2 - b^2}} \tan^{-1} \left(\frac{\sqrt{a-b} \tan(x)}{a+b} \right) \right\} = ,$$

- A. $a + b \sin x$

B. $a + b\cos x$

C. $\frac{1}{a + b\sin x}$

D. $\frac{1}{a + b\cos x}$

Answer: D

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105. If $y = \text{Arctan} \sqrt{\left[\frac{x-a}{b-x} \right]}$ then $\frac{dy}{dx} =$

A. $\frac{1}{2\sqrt{(x+a)(b+x)}}$

B. $\frac{1}{2\sqrt{(x-a)(b-x)}}$

C. $\frac{1}{2(x+a)(b+x)}$

D. $\frac{1}{2(x-a)(b-x)}$

Answer: B

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$$106. \frac{d}{dx} \left\{ x\sqrt{a^2 - x^2} + a^2 \sin^{-1} \left(\frac{x}{a} \right) \right\} =$$

A. $2\sqrt{a^2 + x^2}$

B. $2\sqrt{a^2 - x^2}$

C. $2\sqrt{x^2 - a^2}$

D. none

Answer: B



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$$107. \frac{d}{dx} \left\{ x\sqrt{a^2 + x^2} + a^2 \sinh^{-1} \left(\frac{x}{a} \right) \right\} =$$

A. $2\sqrt{a^2 + x^2}$

B. $2\sqrt{a^2 - x^2}$

C. $2\sqrt{x^2 - a^2}$

D. none

Answer: A

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108. $\frac{d}{dx} \left\{ x\sqrt{x^2 - a^2} - a^2 \cosh^{-1} \left(\frac{x}{a} \right) \right\} =$

A. $2\sqrt{a^2 + x^2}$

B. $2\sqrt{a^2 - x^2}$

C. $2\sqrt{x^2 - a^2}$

D. none

Answer: C

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109. If $y = \log \left\{ \left(\frac{1+x}{1-x} \right)^{1/4} \right\} - \frac{1}{2} \tan^{-1}(x)$, then $\frac{dy}{dx} =$

A. $\frac{x}{1-x^2}$

B. $\frac{x^2}{1-x^4}$

C. $\frac{x}{1+x^2}$

D. $\frac{x}{1-x^4}$

Answer: B



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110. $\frac{d}{dx} \left\{ \frac{1}{6} \log \frac{(x-1)^2}{x^2+x+1} + \frac{1}{\sqrt{3}} \tan^{-1} \left(\frac{2x+1}{\sqrt{3}} \right) \right\} =$

A. $\frac{1}{x^3+1}$

B. $\frac{x}{x^3+1}$

C. $\frac{x}{1+x^2}$

D. $\frac{x}{1-x^2}$

Answer: B



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111. $\frac{d}{dx} \left[a \tan^{-1} x + b \log \left(\frac{x-1}{x+1} \right) \right] = \frac{1}{x^4-1} \Rightarrow a - 2b =$

A. 1

B. -1

C. 0

D. 2

Answer: B



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112. If $y = 2 \tan^{-1} \left(\frac{x\sqrt{2}}{1-x^2} \right) + \log \left(\frac{1+x\sqrt{2}+x^2}{1-x\sqrt{2}+x^2} \right)$ then $\frac{dy}{dx} =$

A. $\frac{1}{1+x^4}$

B. $\frac{2}{1+x^4}$

C. $\frac{2\sqrt{2}}{1+x^4}$

D. $\frac{4\sqrt{2}}{1+x^4}$

Answer: D



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Exercise 1 B

1. If $x = at^2, y = 2at$ then $\frac{dy}{dx} =$

A. $\frac{1}{t}$

B. te^1

C. $\frac{-1}{t^2}$

D. $\frac{t(e^1 - \sin t)}{1 + t \cos t}$

Answer: A



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2. $f(x) = (x^2 - 1)^7 \Rightarrow f^{(14)}(x) =$

A. 0

B. 2!

C. 7!

D. 14!

Answer: D



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3. If $x = ct, y = \frac{c}{t}$ then $\frac{dy}{dx} =$

A. $\frac{1}{t}$

B. te^1

C. $\frac{-1}{t^2}$

D. $\frac{t(e^1 - \sin t)}{1 + t \cos t}$

Answer: C



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4. If $x = \theta - \frac{1}{\theta}, y = \theta + \frac{1}{\theta}$ then $\frac{dy}{dx} =$

A. x/y

B. y/x

C. $-x/y$

D. $-y/x$

Answer: A



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5. If $x = a \operatorname{sech} \theta$, $y = b \tanh \theta$ then $\frac{dy}{dx} =$

A. $\frac{b}{a} \operatorname{cosec} \theta$

B. $\frac{-b}{a} \cot \theta$

C. $\frac{b}{a} \coth \theta$

D. $\frac{-b}{a} \tanh \theta$

Answer: A



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6. If $x = a(t + \sin t)$, $y = a(1 - \cos t)$ and $\frac{dy}{dx} = \tan p$ then $p =$

A. $\frac{2a}{y}$

B. $\frac{-2}{x^3}$

C. $\frac{(b^2x)}{a^2y}$

D. $t/2$

Answer: D



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7. If $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ then $\frac{dy}{dx} =$

A. $\frac{2a}{y}$

B. $\frac{-2}{x^3}$

C. $\frac{b^2x}{a^2y}$

D. $\frac{-b^2x}{a^2t}$

Answer: B

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8. If $ax^2 + 2hxy + by^2 = 0$ then $\frac{dy}{dx} =$

A. $\frac{ax + hy}{hx + by}$

B. $\frac{-(ax + hy)}{hx + by}$

C. $\left(\frac{ax + hy + g}{hx + by + f} \right)$

D. $-\left(\frac{dx + hy + g}{hx + by + f} \right)$

Answer: D

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9. If $ax^2 + 2kxy + by^2 + 2gx + 2fy + c = 0$ then $\frac{dy}{dx} =$

A. $\frac{ax + by}{hx + by}$

B. $\frac{-(ax + hy)}{hx + by}$

$$C. \left(\frac{ax + hy + g}{hx + by + f} \right)$$

$$D. - \left(\frac{ax + ky + g}{kx + by + f} \right)$$

Answer: A



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10. Find $\frac{dy}{dx}$ if $2x^2 - 3xy + y^2 + x + 2y - 8 = 0$.

A. $\frac{3y - 4x - 1}{2y - 3x + 2}$

B. $\frac{3y + 4x + 1}{2y + 3x + 2}$

C. $\frac{3y - 4x + 1}{2y - 3x - 2}$

D. $\frac{3y - 4x + 1}{2y + 3x + 2}$

Answer: C



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11. $\sqrt{\frac{y}{x}} + \sqrt{\frac{x}{y}} = 2 \Rightarrow \frac{dy}{dx} =$

A. $\frac{x^2 + y^2}{x + y}$

B. $\frac{x^2 - y^2}{x + y}$

C. 1

D. 2

Answer: B



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12. If $x^3 + y^3 = 3axy$ then $\frac{dy}{dx} =$

A. $\left(\frac{y}{x}\right)^{1/3}$

B. $-\left(\frac{y}{x}\right)^{1/3}$

C. $\frac{x^2 - ay}{ax - y^2}$

D. $\frac{-y(2x + y)}{x(x + 2y)}$

Answer: B



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13. If $x^3 + y^3 = 3axy$ then $\frac{dy}{dx} =$

A. $\left(\frac{y}{x}\right)^{1/3}$

B. $-\left(\frac{y}{x}\right)^{1/3}$

C. $\frac{x^2 - ay}{ax - y^2}$

D. $\frac{-y(2x + y)}{x(x + 2y)}$

Answer: C



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14. If $xy(x + y) = 2$ then $\frac{dy}{dx} =$

A. $\left(\frac{y}{x}\right)^{1/3}$

B. $-\left(\frac{y}{x}\right)^{1/3}$

C. $\frac{x^2 - ay}{ax - y^2}$

D. $\frac{-y(2x + y)}{x(x + 2y)}$

Answer: D



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15. If $x - y = \sin^{-1}x - \sin^{-1}y$ then $\frac{dy}{dx} =$

A. $\frac{\sqrt{y}(4x\sqrt{x} - \sqrt{y})}{\sqrt{x}(2\sqrt{y} + \sqrt{x})}$

B. $\frac{\sqrt{y}(1 - 2\sqrt{xy} - y)}{\sqrt{x}(1 + 2\sqrt{xy} + x)}$

C. $\frac{2x + 3}{2y + 5}$

$$\sqrt{1 - y^2} - \sqrt{(1 - x^2)(1 - y^2)}$$

D. $\frac{\sqrt{1 - y^2} - \sqrt{(1 - x^2)(1 - y^2)}}{\sqrt{1 - x^2} - \sqrt{(1 - x^2)(1 - y^2)}}$

Answer: D



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16. If $y = 1 + xe^y$ then $\frac{dy}{dx} =$

A. $\frac{e^y}{1 + xe^x}$

B. $\frac{e^y}{1 - xe^y}$

C. $\frac{e^y}{\sqrt{1 + xe^y}}$

D. $\frac{e^y}{\sqrt{1 - xe^y}}$

Answer: B



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17. If $\sin^2 mx + \cos^2 ny = a^2$ then $\frac{dy}{dx} =$

A. $\frac{m \sin(2mx)}{n \sin(2ny)}$

B. $\frac{m \cos(2mx)}{n \sin(2ny)}$

C. $\frac{m \cos(2mx)}{n \cos(2ny)}$

D. $\frac{m \sin(2mx)}{n \cos(2ny)}$

Answer: A



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18. If $x^3 - xy^2 + 3y^2 + 2 = 0$ then $\frac{dy}{dx} =$

A. $\frac{3x^2 + y^2}{2xy - 6y}$

B. $\frac{3x^2 - y^2}{2xy + 6y}$

C. $\frac{3x^2 + y^2}{2xy + 6y}$

D. $\frac{3x^2 - y^2}{2xy - 6y}$

Answer: A

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19. If $3x^2 + 4xy + 2y^2 + x - 8 = 0$ then $\left(\frac{dy}{dx}\right)_{-1, 3} =$

A. $3/8$

B. $-5/7$

C. $5/8$

D. $-7/8$

Answer: D

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20. If $xy = (x + y)^n$ and $\frac{dy}{dx} = \frac{y}{x}$ then $n =$

A. 1

B. 2

C. 3

D. 4

Answer: B



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21. If $y \sin x = x + y$ then $\frac{dy}{dx} \text{ at } x = 0$ is

A. 1

B. -1

C. 0

D. 2

Answer: B



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22. If $\sin(x + y) = \log(x + y)$, then $dy/dx =$

A. 2

B. -2

C. 1

D. -1

Answer: D



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23. If $x^2 - y^2 = a(x - y)$ and $x \neq y$, then $\frac{dy}{dx} =$

A. 0

B. 1

C. -1

D. 2

Answer: C

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24. $x\sqrt{1+y} + y\sqrt{1+x} = 0 \Rightarrow \frac{dy}{dx} =$

A. $\frac{1}{(1+x)^2}$

B. $\frac{-1}{(1+x)^2}$

C. $\frac{1}{1+x^2}$

D. $\frac{1}{1-x^2}$

Answer: B

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25. If $3\sin xy + 4\cos xy = 5$ then $\frac{dy}{dx} =$

A. $-\frac{y}{x}$

B. $\frac{3\sin xy + 4\cos xy}{3\cos xy - 4\sin xy}$

C. $\frac{3\cos xy + 4\sin xy}{4\cos xy - 3\sin xy}$

D. $\frac{x}{y}$

Answer: A



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26. If $\sqrt{\tan y} = e^{\cos 2x} \sin x$, then $\frac{dy}{dx} =$

A. $\sin 2y(\cot x - 2\sin 2x)$

B. $\sin 2x(\cot y - \sin y)$

C. $\sin 2y \sin 2x$

D. $\cos 2y \cos 2x$

Answer: A

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$$27. x^2 + y^2 = t + \frac{1}{t}, x^4 + y^4 = t^2 + \frac{1}{t^2} \Rightarrow x^3 y \frac{dy}{dx} =$$

A. -1

B. 1

C. 0

D. 1

Answer: A

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$$28. \frac{d}{dx} \{x^x\} =$$

A. $x^x \log x$

B. $x^x \log x$

C. $x^x \log_x e$

D. $x^x \log_x x$

Answer: A

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29. $\frac{d}{dx} \left\{ x^{1/x} \right\} =$

A. $x^{1/x-2}(1 + \log x)$

B. $x^{1/x-2}(1 - \log x)$

C. $1 + \log x$

D. $x^{1/x-2}$

Answer: B

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30. The derivative of $(ax + b)^{cx+d}$ w.r.t x is

A. $(ax + b)^{cx+d} \left[\frac{a(cx + d)}{ax + b} + c \log(ax + b) \right]$

B. $(ax - b)^{cx+d} \left[\frac{a(cx + d)}{ax + b} + c \log(ax \pm b) \right]$

C. $(ax - b)^{cx+d} \left[\frac{a(cx + d)}{ax + b} + c \log(ax - b) \right]$

D. $(ax - b)^{cx+d} \left[\frac{a(cx + d)}{ax + b} + c \log(ax + b) \right]$

Answer: A



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31. The derivative of $(\log x)^4$ w.r.t x is

A. $(\log x)^{x-1} [1 + \log x \log(\log x)]$

B. $(\log x)^x - 1 [1 - \log x \log(\log x)]$

C. $(\log x)^{x-1} [1 - \log x \log(\log x)]$

D. $-(\log x)^{x-1}[1 - \log x \log(\log x)]$

Answer: A



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32. The derivative of

$(\sin x)^x$ w.r.t is

A. $(\sin x)^x [x \cot x + \log \sin x]$

B. $(\sin x)^x [x \cot x - \log \sin x]$

C. $-(\sin x)^x [x \cot x + \log \sin x]$

D. $-(\sin x)^x [x \cot x - \log \sin x]$

Answer: A



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33. The derivative of x^{x^x} w.r.t x is

A. $x^{x^x} x^{(x-1)} [1 - x \log x (1 + \log x)]$

B. $x^{x^x} x^{(x-1)} [1 + x \log x (1 - \log x)]$

C. $x^{x^x} x^{(x-1)} [1 + x \log x (1 + \log x)]$

D. $x^{x^x} x^{(x-1)} [1 - x \log x (1 - \log x)]$

Answer: C



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34. The derivative of x^{a^x} w.r.t x is

A. $x^{a^x} a^x [1/x + \log a \log x]$

B. $x^{a^x} a^x [1/x - \log a \log x]$

C. $x^{a^x} a^x [x + \log a \log x]$

D. $x^{a^x} a^x [x - \log a \log x]$

Answer: A



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35. The derivative of $x^{\log(\log x)}$ w.r.t x is

A. $x^{\log(\log x) + 1}[1 + \log(\log x)]$

B. $x^{\log(\log x) + 1}[1 - \log(\log x)]$

C. $x^{\log(\log x) - 1}[1 + \log(\log x)]$

D. $x^{\log(\log x) + 1}[1 + \log(\log x)]$

Answer: C



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36. The derivative of $x^{\sin x}$ w.r.t is

A. $x^{\sin x(-1)}[\sin x + x \cos x \log x]$

B. $x^{\sin x (-1)} [\sin x - x \cos x \log x]$

C. $x^{\sin x (+1)} [\sin x + x \cos x \log x]$

D. $x^{\sin x (+1)} [\sin x - x \cos x \log x]$

Answer: A

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37. The derivative of $(\sin x)^{\cos x} (0 < x < \pi)$ w.r.t is

A. $(\sin x)^{\cot x} [\cos x \cot x + \sin x \log \sin x]$

B. $(\sin x)^{\cot x} [\cos x \cot x - \sin x \log \sin x]$

C. $(\sin x)^{\cos x} [\cos x \cot x + \sin x \log \sin x]$

D. $(\sin x)^{\cos x} [\cos x \cot x - \sin x \log \sin x]$

Answer: D

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38. The derivative of $x^{\log x}$ w.r.t x is

A. $\log x \cdot x^{(\log x) + 1}$

B. $\log x \cdot x^{(\log x) - 1}$

C. $2\log x \cdot x^{(\log x) + 1}$

D. $2\log x \cdot x^{(\log x) - 1}$

Answer: D



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39. If $y = (x^2 + 1)^{\sin x}$ then $y'(0) =$

A. $1/2$

B. e^2

C. 0

D. $3/2$

Answer: C



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40. $y = x^{\sin x} + (\sin x)^x$ then $\frac{dy}{dx} =$

A. $x^{\sin x} \left(\frac{\sin x}{x} + \cos x \log x \right) + (\sin x)^x (x \cot x + \log \sin x)$

B. $x^{\sin x} \left(\frac{\sin x}{x} + \cos x \log x \right) + (\sin x)^x (x \cot x - \log \sin x)$

C. $x^{\sin x} (x \operatorname{cosec} x - \cos x \log x) + (\sin x)^x (x \cot x + \log \cos x)$

D. $x^{\sin x} (x \cos x - \sin x \log x) + (\sin x)^x (x \cot x + \log \sin x)$

Answer: A



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41. The derivative of $(\cot x)^{\sin x} + (\tan x)^{\cos x}$ w.r.t x is

A. $(\cot x)^{\sin x} [\sec x + \cos x \log \cot x] + (\tan x)^{\cos x} [\operatorname{cosec} x - \sin x \log \tan x]$

B. $(\cot x)^{\sin x} [-\sec x + \cos x \log \cot x] + (\tan x)^{\cos x} [\operatorname{cosec} x + \sin x \log \tan x]$

C. $(\cot x)^{\sin x} [\sec x - \cos x \log \cot x] + (\tan x)^{\cos x} [\operatorname{cosec} x - \sin x \log \tan x]$

D. $(\cot x)^{\sin x} [-\sec x + \cos x \log \cot x] + (\tan x)^{\cos x} [\operatorname{cosec} x - \sin x \log \tan x]$

Answer: D



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42. Let y be an implicit function of x defined by $x^{2x} - 2x^x \cot y - 1 = 0$. Then

$y'(1)$ equals

A. 1

B. $\log 2$

C. $-\log 2$

D. -1

Answer: D



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43. The derivative of $\sin x \sin 2x \sin 3x$ w.r.t x is

A. $\sin x \sin 2x \sin 3x [\cot x + 2 \cot 2x + 3 \cot 3x]$

B. $\sin x \sin 2x \sin 3x [\cot x + 2 \cot 2x - 3 \cot 3x]$

C. $\sin x \sin 2x \sin 3x [\cot x - 2 \cot 2x + 3 \cot 3x]$

D. $\sin x \sin 2x \sin 3x [\cot x - 2 \cot 2x - 3 \cot 3x]$

Answer: A



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44. If $y = \left\{ \frac{(3x - 5)^{2/3} (x^2 + 1)^{3/2}}{(2x + 3)^{3/2} (3x^2 - 1)^{1/3}} \right\}$ then $\frac{dy}{dx} =$

A. $y \left[\frac{2}{3x - 5} + \frac{3x}{x^2 + 1} - \frac{3}{2x + 3} - \frac{2x}{3x^2 - 1} \right]$

$$B. \left[\frac{2}{3x-5} + \frac{3x}{x^2+1} - \frac{5}{2x+3} + \frac{2x}{3x^2-1} \right]$$

$$C. \left[\frac{2}{3x-5} - \frac{3x}{x^2+1} - \frac{5}{2x+3} + \frac{2x}{3x^2-1} \right]$$

$$D. \left[\frac{2}{3x-5} + \frac{3x}{x^2+1} + \frac{5}{2x+3} - \frac{2x}{3x^2-1} \right]$$

Answer: A



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45. The derivative of $\sin^{-1}2x\sqrt{1-x^2}$ w.r.t x is

$$A. \frac{-2}{\sqrt{1-x^2}}$$

$$B. \frac{2}{\sqrt{1-x^2}}$$

$$C. \frac{-3}{\sqrt{1-x^2}}$$

$$D. \frac{3}{\sqrt{1-x^2}}$$

Answer: B

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46. The derivative of $\cos^{-1}(2x^2 - 1)$ w.r.t x is

A. $\frac{-2}{\sqrt{1-x^2}}$

B. $\frac{2}{\sqrt{1-x^2}}$

C. $\frac{-3}{\sqrt{1-x^2}}$

D. $\frac{3}{\sqrt{1-x^2}}$

Answer: A

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47. $\frac{d}{dx} \left\{ \cos^{-1} \frac{1-x^2}{1+x^2} \right\} =$

A. $\frac{2}{1+x^2}$

B. $\frac{-2}{\sqrt{1-x^2}}$

C. $\frac{1}{\sqrt{1-x^2}}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: A



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48. If $y = \frac{\sin^{-1}(1-x^2)}{1+x^2}$ then $\frac{dy}{dX} =$

A. $\frac{-2}{1+x^2}$

B. $\frac{2}{1+x^2}$

C. $\frac{1}{1+x^2}$

D. $\frac{-1}{1+x^2}$

Answer: A



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$$49. \frac{d}{dx} \left\{ \sin^{-1}(3x - 4x^3) \right\} =$$

A. $\frac{1}{\sqrt{1-x^2}}$

B. $\frac{2}{\sqrt{1-x^2}}$

C. $\frac{3}{\sqrt{1-x^2}}$

D. $\frac{3}{\sqrt{1+x^2}}$

Answer: C



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50. The derivative of $\cos^{-1}(4x^3 - 3x)$ w.r.t x is

A. $\frac{1}{\sqrt{1-x^2}}$

B. $\frac{2}{\sqrt{1-x^2}}$

C. $\frac{-3}{\sqrt{1-x^2}}$

D. $\frac{3}{\sqrt{1-x^2}}$

Answer: C

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51. $\frac{d}{dx} \left\{ \sin^{-1} \left(\frac{5x + 12\sqrt{1-x^2}}{12} \right) \right\} =$

A. $\frac{1}{\sqrt{1-x^2}}$

B. $\frac{1}{\sqrt{1+x^2}}$

C. $\frac{-1}{\sqrt{1+x^2}}$

D. $\frac{-1}{\sqrt{1-x^2}}$

Answer: A



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$$52. \frac{d}{dx} \left\{ \tan^{-1} \frac{\sqrt{x} + \sqrt{a}}{1 - \sqrt{ax}} \right\} =$$

A. $\frac{1}{2\sqrt{x}(1+x)}$

B. $\frac{-1}{2\sqrt{x}(1+x)}$

C. $\frac{2}{\sqrt{x}(1+x)}$

D. $\frac{-2}{\sqrt{x}(1+x)}$

Answer: A



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$$53. \frac{d}{dx} \left\{ \cos^{-1} \frac{x^{2n} - 1}{x^{2n} + 1} \right\} =$$

$$A. (2nx^{n-1}) \frac{1}{x^{2n} + 1}$$

$$B. \frac{2nx^n}{x^n - 1}$$

$$C. \frac{-2nx^{n-1}}{x^{2n+1}}$$

$$D. \frac{2nx^{n-1}}{x^{2n} - 1}$$

Answer: C

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$$54. \frac{d}{dx} \left\{ \cos^{-1} \frac{x - x^{-1}}{x + x^{-1}} \right\} =$$

$$A. \frac{2}{x + 1}$$

$$B. \frac{-2}{x^2 + 1}$$

$$C. \frac{-2}{x + 1}$$

$$D. \frac{2}{x^2 + 1}$$

Answer: B



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$$55. \frac{d}{dx} \left\{ \sin^2 \cot^{-1} \frac{\sqrt{1+x}}{1-x} \right\} =$$

A. 0

B. 1/2

C. -1/2

D. -1

Answer: C



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$$56. \frac{d}{dx} \left\{ \sin^{-1} \left(\frac{3x}{2} - \frac{x^3}{2} \right) \right\} =$$

A. $\frac{3}{\sqrt{4-x^2}}$

B. $\frac{-3}{\sqrt{4-x^2}}$

C. $\frac{1}{\sqrt{4-x^2}}$

D. $\frac{-1}{\sqrt{4-x^2}}$

Answer: A



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57. $\frac{d}{dx} \left\{ \cos^{-1} \left(\frac{4x^3}{27} - x \right) \right\} =$

A. $\frac{3}{\sqrt{9-x^2}}$

B. $\frac{1}{\sqrt{9-x^2}}$

C. $\frac{-3}{\sqrt{9-x^2}}$

D. $\frac{-1}{\sqrt{9-x^2}}$

Answer: C



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$$58. \frac{d}{dx} \left\{ \cos^{-1} \left(\sqrt{\frac{1+x}{2}} \right) \right\} =$$

A. $\frac{-1}{2\sqrt{1-x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: A



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$$59. \frac{d}{dx} \left\{ \sin^{-1} \left(\sqrt{\frac{1-x}{2}} \right) \right\} =$$

A. $\frac{-1}{2\sqrt{1-x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: A



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60. $\frac{d}{dx} \left\{ \sin^{-1} \frac{x}{\sqrt{1+x^2}} \right\} =$

A. $\frac{-2}{2\sqrt{1-x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: B

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$$61. \frac{d}{dx} \left\{ \sin^{-1} \frac{2x}{1+x^2} \right\} =$$

A. $\frac{-2}{2\sqrt{1-x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: C

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$$62. \frac{d}{dx} \left\{ \tan^{-1} \frac{2x}{1-x^2} \right\} =$$

A. $\frac{-2}{2\sqrt{1-x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: C



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63. $\frac{d}{dx} \left\{ \sec^{-1} \frac{1}{1-2x^2} \right\} =$

A. $\frac{-1}{2\sqrt{1-x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: D



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$$64. \frac{d}{dx} \left\{ \tan^{-1} \left(\sqrt{\frac{x^2}{a^2 - x^2}} \right) \right\} =$$

A. $\frac{1}{\sqrt{a^2 - x^2}}$

B. $\frac{1}{a^2 + x^2}$

C. $\frac{1}{1 + x^2}$

D. $\frac{2}{\sqrt{1 - x^2}}$

Answer: D

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$$65. \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{x - a}{1 + ax} \right) \right\} =$$

A. $\frac{-1}{2\sqrt{1 - x^2}}$

B. $\frac{1}{1+x^2}$

C. $\frac{2}{1+x^2}$

D. $\frac{2}{\sqrt{1-x^2}}$

Answer: B



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66. $\frac{d}{dx} \left\{ \frac{\tan^{-1}(\sqrt{1+x^2}-1)}{x} \right\} =$

A. $\frac{1}{2(1+x^2)}$

B. $\frac{-1}{2\sqrt{1-x^2}}$

C. $\frac{3}{1+x^2}$

D. $\frac{1}{2\sqrt{1-x^2}}$

Answer: A



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$$67. \tan^{-1} \left(\frac{3x - x^3}{1 - 3x^2} \right) =$$

A. $\frac{1}{2(1 + x^2)}$

B. $\frac{-1}{2\sqrt{1 - x^2}}$

C. $\frac{3}{1 + x^2}$

D. $\frac{1}{2\sqrt{1 - x^2}}$

Answer: C



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$$68. \frac{d}{dx} \left\{ \tan^{-1} \frac{\sqrt{1-x}}{1+x} \right\} =$$

A. $\frac{1}{2(1+x)^2}$

B. $\frac{-1}{2\sqrt{1-x^2}}$

C. $\frac{3}{1+x^2}$

D. $\frac{1}{2\sqrt{1-x^2}}$

Answer: B

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69. $\frac{d}{dx} \left\{ \tan^{-1} \sqrt{\left[\frac{x}{1-x} \right]} \right\} =$

A. $\frac{1}{2(2+x^2)}$

B. $\frac{-1}{2\sqrt{x-x^2}}$

C. $\frac{3}{x+x^2}$

D. $\frac{1}{2\sqrt{1-x^2}}$

Answer: D



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$$70. \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{x}{1 + \sqrt{1 - x^2}} \right) \right\} =$$

A. $\frac{1}{2(1 + x^2)}$

B. $\frac{2}{\sqrt{1 - x^2}}$

C. $\frac{3}{1 + x^2}$

D. $\frac{1}{2\sqrt{1 - x}}$

Answer: D



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$$71. \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{x}{1 - \sqrt{1 + x^2}} \right) \right\} =$$

A. $\frac{-1}{2(1 + x^2)}$

B. $\frac{2}{\sqrt{1 - x^2}}$

C. $\frac{3}{1 + x^2}$

D. $\frac{1}{2(1 + x^2)}$

Answer: D

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$$72. \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{x - x^{1/2}}{1 + x^{3/2}} \right) \right\} =$$

A. $\frac{1}{1 + x^2} - \frac{1}{2(1 + x)\sqrt{x}}$

B. $\frac{1}{2\sqrt{1 + x^2}}$

$$C. \frac{1}{\sqrt{1+x^2}}$$

$$D. \frac{1}{2\sqrt{1-x^2}}$$

Answer: A

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$$73. \frac{d}{dx} \left\{ \tan^{-1} \frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}} \right\} =$$

$$A. \frac{1}{1+x^2} - \frac{1}{2(1+x)\sqrt{x}}$$

$$B. \frac{-x}{\sqrt{1-x^4}}$$

$$C. \frac{1}{\sqrt{1+x^2}}$$

$$D. \frac{1}{2\sqrt{1-x^2}}$$

Answer: B

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74. The derivative of $\tan^{-1} \frac{2x}{1-x^2}$ w.r.t $\cos^{-1} \frac{1-x^2}{1+x^2}$ is

- A. 0
- B. 1
- C. 2
- D. 3

Answer: B



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75. The derivative of $\text{Arctan} \frac{2x}{1-x^2}$ w. r. t. $\text{Arcsin} \frac{2x}{1+x^2}$ is

- A. 0
- B. 1
- C. 2

D. 3

Answer: B



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76. The derivative of $\tan^{-1} \frac{\sqrt{1+x^2} - 1}{x}$ w.r.t. $\tan^{-1} x$ is

A. 0

B. 1

C. 2

D. +1/2

Answer: D



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77. The derivative of $\cos^{-1} \frac{1-x^2}{1+x^2}$ w. r. t. $\tan^{-1} \frac{2x}{1-x^2}$ is

- A. 0
- B. 1
- C. 2
- D. 1/2

Answer: B



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78. The derivative of $\sin^{-1} \frac{2x}{1+x^2}$ w. r. t. $\tan^{-1} \frac{2x}{1-x^2}$ is

- A. 0
- B. 1
- C. -1
- D. 2

Answer: B

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79. The derivative of $\cos^{-1}(2x^2 - 1)$ w. r. t. $\cos^{-1}x$ is

A. 2

B. $\frac{2}{x}$

C. $\frac{2}{2\sqrt{1-x^2}}$

D. $\sqrt{1-x^2}$

Answer: A

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80. The derivative of $\sec^{-1}\frac{1}{2x^2 - 1}$ w. r. t. $\sqrt{1+3x}$ is $-\frac{1}{3}$ is

A. 0

B. 1

C. 1/2

D. -2/3

Answer: A



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81. The derivative of $\tan^{-1} \frac{\sqrt{1+x^2}-1}{x}$ w. r. t. $\tan^{-1} \frac{2x\sqrt{1-x^2}}{1-2x^2}$ at $x = 0$ is

A. 1

B. 1/2

C. 1/4

D. 1/8

Answer: D

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82. The derivative of $\sin^{-1}(3x - 4x^3)$ w. r. t. $\tan^{-1}\frac{x}{\sqrt{1-x^2}}$ is

A. 0

B. 1

C. 2

D. 3

Answer: D

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83. If $y = \sqrt{\sin x + y}$ then $\frac{dy}{dx} =$

A. $\frac{\cos x}{y - 1}$

B. $\frac{\cos y}{x - 1}$

C. $\frac{\cos x}{2y - 1}$

D. $\frac{\cos y}{2x - 1}$

Answer: C

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84. If $y = \sqrt{\cos x + y}$ thnd $\frac{dy}{dx} =$

A. $\frac{\sin x}{y - 1}$

B. $\frac{\sin y}{1 - x}$

C. $\frac{\sin x}{1 - 2y}$

D. $\frac{\sin y}{2x - 1}$

Answer: B

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85. If $\sin y = x \sin(\alpha + y)$ then $\frac{dy}{dx} =$

A. $\frac{\sin \alpha}{\sin^2(\alpha + y)}$

B. $\frac{\sin^2(\alpha + y)}{\sin \alpha}$

C. $\sin \alpha \sin^2(\alpha + y)$

D. $\frac{\sin^2(\alpha - y)}{\sin \alpha}$

Answer: B



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86. If $\cos y = x \cos(a + y)$ then $\frac{dy}{dx} =$

A. $\frac{\sin^2(a + y)}{\sin a}$

B. $\frac{\cos^2(a - y)}{\sin a}$

C. $\frac{\sin^2(a + y)}{\sin a}$

D. $\frac{\cos^2(a + y)}{\sin a}$

Answer: D



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87. If $\cos^{-1}\left(\frac{x^2 - y^2}{x^2 + y^2}\right) = k$ (a constant), then $\frac{dy}{dx} =$

A. $\frac{y}{x}$

B. $\frac{x}{y}$

C. $\frac{x^2}{y^2}$

D. $\frac{y^2}{x^2}$

Answer: A



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88. If $\sqrt{1 + x^2} + \sqrt{1 + y^2} = a(x - y)$ then $\frac{dy}{dx} =$

$$\frac{\sqrt{1+y^2}}{\sqrt{1+x^2}}$$

A. $\frac{\sqrt{1+x^2}}{\sqrt{1+y^2}}$

B. $\frac{\sqrt{1+y^2}}{\sqrt{1+x^2}}$

C. 0

D. 1

Answer: A



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89. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ then $\frac{dy}{dx} =$

A. $\frac{\sqrt{1+y^2}}{\sqrt{1+x^2}}$

B. $\frac{\sqrt{1+x^2}}{\sqrt{1+y^2}}$

C. $\frac{\sqrt{1-y^2}}{\sqrt{1+x^2}}$

$$\sqrt{1-y^2}$$

D. $\frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$

Answer: D



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90. If $y = x^y$ then $\frac{dy}{dx} =$

A. $\frac{y^2}{x(1 + \log y)}$

B. $\frac{y^2}{x(1 - \log y)}$

C. $\frac{y}{x^2(1 + \log y)}$

D. $\frac{y}{x^2(1 - \log y)}$

Answer: B



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91. If $x^y = e^{x-y}$ then $\frac{dy}{dx} =$

A. $\frac{1}{(1 + \log y)}$

B. $\frac{\log x}{(1 + \log x)^2}$

C. $\left(\frac{\log}{1 + \log x}\right)^2$

D. $\frac{(\log x)^2}{1 + \log y}$

Answer: A



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92. If $x^y = \log x$ then $\frac{dy}{dx}$ at $x = e$ is

A. 0

B. 1

C. e

D. $1/e$

Answer: C



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93. $x^y = y^x \Rightarrow x(x - y \log x) \frac{dy}{dx} =$

A. $y(y - x \log y)$

B. $y(y + x \log y)$

C. $x(x + y \log x)$

D. $x(y - x \log y)$

Answer: A



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94. $\frac{d}{dx} \left\{ e^{x^e} + x^{e^x} + e^{x^x} \right\} =$

A. $e^{x^e} + x^{e^x} + e^{x^x}$

B. $x^2e^{x^e} + e^x x^{e^x} + x^x + e^{x^x}$

C. $ee^{x^e} x^{e-1} + x^{e^x} \left(\frac{1}{x} + \log x \right) + e^{x^x} x^x (1 + \log x)$

D. none

Answer: D



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95. If $(\cos x)^y = (\sin y)^x$ then $\frac{dy}{dx} =$

A. $\frac{\log \sin y + y \tan x}{\log \cos x - x \cot y}$

B. $\frac{\log \sin y - y \tan x}{\log \cos x + \cot y}$

C. $\frac{\log \sin y}{\log \cos x}$

D. $\frac{\log \cos x}{\log \sin y}$

Answer: A



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96. If $y = \sqrt{\sqrt{x + \sqrt{x + \sqrt{x + \dots}}}} \cdot \infty$ then $\frac{dy}{dx} =$

A. $\frac{1}{y}$

B. $\frac{1}{x}$

C. $\frac{1}{2x - 1}$

D. $\frac{1}{2y - 1}$

Answer: D



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97. If $y = \sqrt{\sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \dots}}}} \cdot \infty$ then $\frac{dy}{dx} =$

A. $\frac{\cos^2 x}{2y - 1}$

B. $\frac{\sec^2 x}{2y - 1}$

C. $\frac{\tan x}{2y - 1}$

D. $\frac{\cot x}{2y - 1}$

Answer: B

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98. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots}^\infty}}$ then $\frac{dy}{dx}$

A. $\frac{\cos x}{y - 1}$

B. $\frac{\cos y}{x - 1}$

C. $\frac{\cos x}{2y - 1}$

D. $\frac{\cos y}{2x - 1}$

Answer: C

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99. If $y = x^{x^{x^{\dots \infty}}}$ then $\frac{dy}{dx} =$

A. $\frac{y^2}{x(1 + y \log x)}$

B. $\frac{y^2}{x(1 - \log y)}$

C. $\frac{y}{x(1 + y \log x)}$

D. $\frac{y}{x(1 - \log y)}$

Answer: B



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100. If $y = (\sin x)^{(\sin x)^{(\sin x)^{\dots \infty}}}$, then $\frac{dy}{dx} =$

A. $\frac{y^2}{\sin x [1 - \log y]}$

B. $\frac{y^2 \sin x}{1 - \log y}$

C. $\frac{y^2 \cot x}{1 - \log y}$

D. $\frac{y^2 \tan x}{1 - \log y}$

Answer: C



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101. If $y = e^{x+e^x+e^{x\dots\infty}}$, then $\frac{dy}{dx} =$

A. y

B. $\frac{1}{y}$

C. $\frac{1}{1-y}$

D. $\frac{y}{1-y}$

Answer: D



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102. If $x = e^{y+e^{y+\dots 10^\infty}}$, $x > 0$, then $\frac{dy}{dx}$ is

A. $\frac{x}{1+x}$

B. $\frac{1+x}{x}$

C. $\frac{1-x}{x}$

D. $\frac{1}{x}$

Answer: C

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103. If $y = x + \frac{1}{x + \frac{1}{x + \dots \infty}}$ then $\frac{dy}{dx} =$

A. $\frac{y}{2y-x}$

B. $\frac{y}{x+2y}$

C. $\frac{y}{x-2y}$

D. y

Answer: A

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104. If $y = \sqrt{x}\sqrt{x}\sqrt{x}\dots^\infty$, then $\frac{dy}{dx} =$

A. $\frac{-y^2}{x(2 - y\log x)}$

B. $\frac{-y^2}{2 + y\log x}$

C. $\frac{y^2}{2 - y\log x}$

D. $\frac{y^2}{x(2 - y\log x)}$

Answer: D

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105. If $y = a^{x^{a^{x^{a^{\dots^\infty}}}}}$ then $\frac{dy}{dx} =$

A. $\frac{y^2 \log y}{x(1 - y \log x \log y)}$

B. $\frac{\log y}{1 - \log x}$

C. $\frac{\log x}{1 + y \log y}$

D. none

Answer: A

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106. If $y = x^2 + \frac{1}{x^2} + \frac{1}{x^2 + \dots \infty}$, then $\frac{dy}{dx} =$

A. $\frac{2xy^2}{y^2 + 1}$

B. $\frac{2xy}{y^2 + 1}$

C. $\frac{2x}{y^2 + 1}$

D. $\frac{2}{y^2 + 1}$

Answer: A

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107. If $x < 1$, then $\frac{1}{x+1} + \frac{2x}{1+x^2} + \frac{4x^3}{1+x^4} + \dots \infty =$

A. x

B. $\frac{1}{1+x}$

C. $\frac{1}{1-x}$

D. $\frac{1}{x}$

Answer: C



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108. If $|x| < 1$ then $\frac{1-2x}{1-xx^2} + \frac{2x-4x^3}{1-x^2+x^4} + \frac{4x^3-8x^7}{10x^4+x^8} + \dots \infty =$

A. $\frac{1+2x}{1+1+x^2}$

B. $\frac{1-2x}{1+x+x^2}$

C. $\frac{(1+2x)^2}{1+x+x^2}$

D. $\frac{(1+2x)^3}{1+x+x^2}$

Answer: A

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109. If $f(x) = x^2 + \frac{x^2}{(1+x^2)} + \frac{x^2}{(1+x^2)} + \dots + \left(x^2 \left(\frac{1}{1+x^2} \right) + \dots \right)$ then

$x = 0$

- A. $f(x)$ has no limit
- B. $f(x)$ is discontinuous
- C. $f(x)$ is continuous but not differentiable
- D. $f(x)$ is differentiable

Answer: B

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110. $f(x) = (\cos x)(\cos 2x) \dots (\cos nx) \Rightarrow f'(x) + \sum_{r=1}^n (\tan rx) f(x) =$

- A. $f(x)$

B. 0

C. $-f(x)$

D. $2f(x)$

Answer: B

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111. If $y = \left\{ \sin \frac{x}{2} \sin \frac{x^2}{2^2} \cdot \sin \frac{x^3}{2^3} \dots \cdot \sin \frac{x^n}{2^n} \right\}$ then $\frac{dy}{dx} =$

A. $y \left(\frac{1}{2} \right) \tan \frac{x}{2} + \tan \frac{x^2}{2^2} + \dots + \frac{nx^{n-1}}{x^n} \tan \frac{x^n}{2^n}$

B. $\left(\frac{1}{2} \right) \tan \frac{x}{2} + \left(\frac{x}{2} \right) \tan \frac{x^2}{2^2} + \dots + \frac{nx^{n-1}}{2^n} \tan \frac{x^n}{2^n}$

C. $y \left\{ \left(\frac{1}{2} \right) \cot \frac{x}{2} + \left(\frac{x}{2} \right) \cot \frac{x^2}{2^2} + \dots + \left(\frac{nx^{n-1}}{2^n} \right) \cot \frac{x^n}{2^n} \right\}$

D. $\left(\frac{1}{2} \right) \cot \frac{x}{2} \left(\frac{x}{2} \right) \cot \frac{x^2}{2^2} + \dots + \frac{nx^{n-1}}{2^n} \cot \frac{x^n}{2^n}$

Answer: C



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112. If $\cos \frac{x}{2} \cos \frac{x}{2^2} \dots \cos \frac{x}{2^n} = \frac{\sin x}{2^n \sin(x/2^n)}$ then

$$\left(\frac{1}{2^2}\right) \sec^2 \frac{x}{2} + \left(\frac{1}{2^4}\right) \sec^2 \frac{x}{2^2} \dots \left(\frac{1}{2^{2n}}\right) \sec^2 \frac{x}{2^n} =$$

A. $\left(\frac{1}{2^{2n}}\right) \operatorname{cosec}^2 \frac{x}{2^n} + \operatorname{cosec}^2 x$

B. $-\left(\frac{1}{2^{2n}}\right) \operatorname{cosec}^2 \frac{x}{2^n} + \operatorname{cosec}^2 x$

C. $\operatorname{cosec}^2 \frac{x}{2^n} + \operatorname{cosec}^2 x$

D. none

Answer: B



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113. If $\sin\theta\sin(2\alpha + \theta)\sin(4\alpha + \theta)\dots\sin(2(n - 1)\alpha + \theta) = \frac{\sin n\theta}{2^{n-1}}$ where $2n\alpha = \pi$

then $\cot(\theta) + \cot(2\alpha + \theta) + \cot(4\alpha + \theta) + \dots + \cot(2n - 1)\alpha + \theta) =$

A. $2^n \cot n\theta$

B. $4^n \tan n\theta$

C. $3 \cot n\theta$

D. none

Answer: C



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114.

If

$$Y = \tan^{-1}\left(\frac{1}{1+x+x^2}\right) + \tan^{-1}\left(\frac{1}{x^2+3x+3}\right) + \tan^{-1}\left(\frac{1}{x^2+5x+7}\right) + \dots +$$

upto n term then $y^1(0) =$

A. $-1(n^2 + 1)$

B. $-n^2/(n^2 + 1)$

C. $n^2/(n^2 + 1)$

D. none

Answer: C

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Exercise 1 C

1. The function $y = \sin^{-1}(\cos x)$ is not differentiable at

A. $x = \pi$

B. $x = \pi/2$

C. $x = 0$

D. $x = \pi/4$

Answer: A



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2. The function $f(x) = \sin^{-1}(\tan x)$ is not differentiable at

A. $x = 0$

B. $x = -\pi/6$

C. $x = \pi/6$

D. $x = \pi/4$

Answer: D



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3. The set of all points where at tunction $f(x) = \sqrt{1 - e^{-x}}$ is differentiable is

A. $(0, \infty)$

B. $(-\infty, \infty)$

C. $(-\infty, 0) \cup (0, \infty)$

D. $(-\infty, 0)$

Answer: C



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Exercise 1 D

1. $y = \sin^{-1}x \Rightarrow (1 - x^2) \frac{d^2y}{dx^2} =$

A. $-x \frac{dy}{dx}$

B. 0

C. $x \frac{dy}{dx}$

D. $\left(\frac{dy}{dx}\right)^2$

Answer: C



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2. If $y = \cos(3\cos^{-1}x)$ then $\frac{dy}{dx^3} =$

A. 6

B. 24

C. 3

D. 0

Answer: B



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3. $y = \sin(m\sin^{-1}x) \Rightarrow (1 - x^2)y_2 - xy_1 =$

A. m^2y

B. $-m^2y$

C. $2m^2y$

D. $-2m^2y$

Answer: B



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4. If $y = \sin(7\sin^{-1}x)$ then $(1 - x^2)y_2 - xy_1 =$

A. $-49y$

B. $-7y$

C. $49y$

D. $7y$

Answer: A



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5. If $y = \tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$ then $\frac{d^2y}{dx^2} =$

- A. 0
- B. $\sin x$
- C. $\cos x$
- D. -1

Answer: A



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6. If $y = x^{n-1}\log x$, then $xy_1 =$

- A. $(n - 1)y + x^{n-1}$
- B. -1
- C. 1
- D. none

Answer: A



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7. If $y = \log \sin x$ then $y_2 =$

A. $\frac{1}{\operatorname{cosec} x}$

B. $-\operatorname{cosec} x \cot x$

C. $-\operatorname{cosec}^2 x$

D. $\operatorname{cosec}^2 x$

Answer: C



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8. If $y = \frac{\log x}{x}$ then $y_1(1) =$

A. -3

B. 1

C. 0

D. 3

Answer: B

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9. If $y = a\cos mx + b\sin mx$, then $\frac{d^2y}{dx^2} =$

A. $-m^2y$

B. m^2y

C. my^2

D. my

Answer: A

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10. If $y = (1 + x^2)\tan^{-1}x$ then $y_2 =$

A. $\frac{2x}{1 + x^2} + 2\tan^{-1}x$

B. $\frac{2x}{1 + x^2} - 2\tan^{-1}x$

C. $\frac{2x}{1 - x^2} + \tan^{-1}x$

D. $\frac{2x}{1 - x^2} - 2\tan^{-1}x$

Answer: A



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11. If $y = e^{-x}\cos x$ then $y_4 =$

A. y

B. $2y$

C. $4y$

D. $-4y$

Answer: D



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12. If $y = \frac{5x + 7}{2x - 3}$ then $y_2 =$

A. $\frac{44}{(2x + 1)^3}$

B. $\frac{-44}{(2x + 1)^3}$

C. $\frac{116}{(2x - 3)^3}$

D. $\frac{-116}{(2x - 3)^2}$

Answer: C



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13. If $y = \frac{ax + b}{cx + d}$ then $2y_1y_3 =$

A. y_2

B. y_2^2

C. $3y_2^2$

D. $4y_2^2$

Answer: C



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14. If $y = e^{\sqrt{x}} + e^{-\sqrt{x}}$ then $xy'' + y' / 2 =$

A. y

B. $4y$

C. $y/2$

D. $y/4$

Answer: D



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15. If $y = \log\left(x + \sqrt{x^2 + 1}\right)$ then $y_2(1) =$

A. 0

B. 1

C. $-12/\sqrt{2}$

D. $-1/2\sqrt{2}$

Answer: D



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16. If $y = \log\left(x + \sqrt{x^2 - 1}\right)$ then, $y_2(\sqrt{2}) =$

A. $-\sqrt{2}$

B. $1/2$

C. $\sqrt{2}$

D. none

Answer: A

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17. If $\frac{1}{1+x+x^2+x^3}$ then $y_2(0) =$

A. 1

B. -1

C. 1/2

D. 0

Answer: D

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18. If $f(x) = \frac{x^3}{x^2 - 1}$ then $f'(0) =$

A. 1

B. -2!

C. 0

D. 2!

Answer: C



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19. If $y = a + bx^2$, a, b arbitrary constants, then

A. $\frac{d^2y}{dx^2} = 2xy$

B. $x \frac{d^2y}{dx^2} = y_1$

C. $x \frac{d^2y}{dx^2} - \frac{dy}{dx} + y = 0$

D. $x \frac{d^2y}{dx^2} = 2xy$

Answer: B



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20. If $y = \sqrt{\cos 2x}$ then $y \frac{d^2y}{dx^2} + 2y^2 =$

A. 0

B. $-\left(\frac{dx}{dy}\right)^2$

C. $\left(\frac{dy}{dx}\right)^2$

D. $y \frac{dy}{dx}$

Answer: B



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21. If $y = \sqrt{\sec 2x}$ then $y_2 =$

A. $3y^5 - y$

B. $3y - y$

C. y

D. none

Answer: A



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22. If $f(x) = \frac{x^2}{a+x}$ then $f'(a) =$

A. $4a$

B. $1/8a$

C. $1/4a$

D. $8a$

Answer: C





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23. If $y = \sqrt{ax} + \frac{a^2}{\sqrt{ax}}$ then y_1, y_2 at $x = a$ are

A. 0, $1/2a$

B. 1, 1

C. 0, 1

D. 0, 0

Answer: A



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24. If $y = a\cos 2x + b\sin 2x$ then $y_2 + 4y =$

A. 2

B. 1

C. 0

D. none

Answer: C



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25. If $y = 3^x$, then $\frac{d^2y}{dx^2} =$

A. $x(x - 1)3^{x-2}$

B. 1

C. $\log 3$

D. $y(\log 3)^2$

Answer: D



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26. If $y = xe^{-x}$ then $y_2 + 2y_1 + y =$

A. 0

B. 1

C. 2

D. none

Answer: A



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27. If $y = x^2 \cos 3x$ then $y_2 + y = 0$ is

A. 0

B. 1

C. 2

D. none

Answer: C



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28. If $x = e^{2t} \cos, 3t$, then $\frac{d^2x}{dt^2} \text{ at } t = \pi/2$ is

A. $12e^\pi$

B. $-12e^\pi$

C. $6e^\pi$

D. .

Answer: A



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29. Show that $y = x + \tan x$ satisfies the equation $\cos^2 x \frac{dy^2}{dx^2} + 2x = 2y$.

A. $2y$

B. y

C. 0

D. 1

Answer: A



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30. If $y = \sin(\sin x)$ then $y_2 + (\tan x)y_1 + y(\cos^2 x) =$

A. 0

B. 1

C. 2

D. none

Answer: A





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31. If y_k is the k th derivative of y with respect to x , $y = \cos(\sin x)$ then

$$y_1 \sin x + y_2 \cos x =$$

- A. $y \sin^3 x$
- B. $-y \sin^3 x$
- C. $y \cos^3 x$
- D. $-y \cos^3 x$

Answer: D



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32. If $y = ax^2 + b/x$ then $x^2 y_2 =$

- A. y
- B. $2y$

C. 1

D. 0

Answer: B

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33. If $y = ax^4 + \frac{b}{x^3}$, then $\frac{d^2y}{dx^2} =$

A. $12x^2/y$

B. $12y/x^2$

C. $12x^2y$

D. none

Answer: B

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34. If $y = a\cos x + (b + 2x)\sin x$ then $y_2 + y =$

A. $4\cos x$

B. $\cos x$

C. x

D. none

Answer: A



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35. If $y = a + be^{-4x}$ then $y_2 + 4y_1 =$

A. 0

B. 1

C. 2

D. 3

Answer: A



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36. If $y = ax + b/x$ then $x^2y_2 + xy_1 - y =$

A. 1

B. 0

C. 2

D. none

Answer: B



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37. If $xy = ae^x + be^{-x}$ then $xy_2 + 2y_1 - xy =$

A. 0

B. y

C. a

D. none

Answer: A

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38. If $y = \left(x + \sqrt{x^2 - 1}\right)^m$ then $(x^2 - 1)y_2 + xy_1 =$

A. 1

B. m^2y

C. m^2

D. y

Answer: B

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39. If $y = xe^{-1/x}$ then $x^3y_2 - xy_1 + y =$

A. 1

B. 0

C. 2

D. -1

Answer: B



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40. If $y = e^{\sin^{-1}x}$ then $(1 - x^2)y_2 - xy_1 - y =$

A. 0

B. 1

C. 2

D. none

Answer: A



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41. If $y = \sin(\log_e x)$ then $\left(x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} = \right.$

A. $\sin(\log_e x)$

B. $\cos(\log_e x)$

C. y^2

D. $-y$

Answer: D



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42. If $y = a\cos(\log x) + b\sin(\log x)$ then $x^2y_2 + xy_1 + y =$

A. 0

B. 1

C. 2

D. none

Answer: A



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43. $\cos^{-1}\left(\frac{y}{b}\right) = 2\log\left(\frac{x}{2}\right), x > 0 \Rightarrow x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} =$

A. $4y$

B. $-4y$

C. 0

D. $-8y$

Answer: B



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44. If $y\sqrt{1+x^2} = \log(x + \sqrt{1+x^2})$ then $(1+x^2)y_1 + xy =$

A. 1

B. 0

C. 2

D. -1

Answer: A



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45. If $y = ae^{-bx}\cos(cx + d)$ then $y_2 + 2by_1 + (b^2 + c^2)y =$

A. 1

B. 0

C. 2

D. -1

Answer: B



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46. If $y = ax^{n+1} + bx^{-n}$ then $x^2y_2 =$

A. $n(n + 1)y$

B. n

C. $n(n + 1)$

D. 1

Answer: A



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47. If $y = ae^{nx} + be^{-nx}$ then $y_2 =$

A. n^2

B. n

C. n^2y

D. none

Answer: C



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48. If $y = e^{-kx/2}(a\cos nx + b\sin nx)$ then $y_2 + ky_1 + (n^2 + k^2/4)y =$

A. 0

B. 1

C. 2

D. none

Answer: A



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49. If $y = a\cos(\sin x) + b\sin(\sin x)$ then $y_2 + (\tan x)y_1 =$

A. $-y\cos^2 x$

B. $\cos x$

C. $y\cos x$

D. none

Answer: A



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50. $f(x) = 10\cos x + (13 + 2x)\sin x \Rightarrow f'(x) + f(x) =$

A. $\cos x$

B. $4\cos x$

C. $\sin x$

D. $4\sin x$

Answer: B



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51. If $ay^4 = (x + b)^5$ then $5yy_2 =$

A. y_1^2

B. y^2

C. y_1

D. y

Answer: A



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52. If $ax^2 + by^2 = c$, then $y_2 =$

A. a

B. $\frac{-ac}{b^2y^3}$

C. $\frac{-a}{b}$

D. 0

Answer: B



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53. If $x^2 + xy + y^2 = a^2$, then $y_2 =$

A. $\frac{-6a^2}{(a + 2y)^2}$

B. -6

C. 6

D. none

Answer: A

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54. If $x^3 + y^3 = 3axy$ then $y_2 =$

A. $\frac{-2a^2xy}{(y^2 - ax)^3}$

B. $-2a^3$

C. -2

D. none

Answer: A

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55. If $y^2 = (x - a)(x - b)$ then $\frac{d^3}{dx^3} \left[\left(\frac{d^2y}{(dx^2)^{-2/3}} \right) \right] =$

A. 0

B. 1

C. 2

D. -1

Answer: A



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56. If $x^3 + y^3 = 3ax^2$ then $y_2 =$

A. $\frac{-2a^2x^2}{y^5}$

B. $\frac{4a^2x^2}{y^5}$

C. y^5

D. 1

Answer: A





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57. If $y^2 = a^2\cos^2x + b^2\sin^2x$ then $y + y_2 =$

A. a^2b^2

B. $\frac{a^2b^2}{y^3}$

C. y^3

D. none

Answer: B



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58. If $ax^2 + 2hxy + by^2 = 1$ then $(hx + by)^3y_2 =$

A. 0

B. 1

C. $h^2 - ab$

D. $ab - h^2$

Answer: C



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59. If $x^3 - 3ax^2 + y^3 = 0$ then $y^5 y_2 =$

A. $-2a^2 x^2$

B. $2a^2 x^2$

C. $a^2 x^2$

D. $-a^2 x^2$

Answer: A



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60. If $x^2 + y^2 = a^2$ then $\frac{(1 + y_1^2)^{3/2}}{|y_2|} =$

A. a^2

B. a

C. $1/a$

D. none

Answer: B



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61. If $y^2 = 4ax$ then $4a^2(1 + y_1^2)^{3/2} + (y^2 + 4a^2)^{3/2}y_2 =$

A. 0

B. 1

C. -1

D. none

Answer: A



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62. If $x^2 + 5xy + y^2 = -2x + y - 6 = 0$ then y'' at $(1, 1)$ is

A. $\frac{3}{64}$

B. $\frac{110}{256}$

C. $\frac{111}{128}$

D. none

Answer: A



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63. If $\sqrt{x} + \sqrt{y} = \sqrt{a}$ then $y_2 + (1 + y_1)^3 y =$

A. $1/2a$

B. $1/2$

C. $1/a$

D. $-1/2a$

Answer: A



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64. If $y = \sin(x + y)$ then $y_2 + (1 + y_1)^3 y =$

A. 0

B. 1

C. -1

D. $\cos(x + y)$

Answer: A



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65. If $x^2 - xy + y^2 = 1$ and $y''(1) =$

A. -6

B. $\frac{2}{3}$

C. $\frac{3}{2}$

D. $-\frac{2}{3}$

Answer: A



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66. If $x^2 - 2x^2y^2 + 5x + y - 5 = 0$ and $y(1)$ then $y''(1) =$

A. $-8\frac{22}{27}$

B. $-7\frac{21}{28}$

C. $\frac{22}{7}$

D. 8

Answer: A



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67. If $x = t^2, y = t^3$ then $\frac{d^2y}{dx^2} =$

A. $3/2$

B. $1/4t$

C. $3/2t$

D. $3t/2$

Answer: B



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68. If $x = \left(\frac{2}{t^2}\right)$, $y = t^3 - 1$, then $\frac{d^2y}{dx^2} =$

A. $15t^2$

B. $\frac{15}{16t^2}$

C. $\frac{15t^7}{16}$

D. $16t^2$

Answer: C



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69. If $x = a\cos^3\theta$, $y = a\sin^3\theta$ then $\frac{d^2y}{dx^2}$ at $\theta = \pi/4$ is

A. $\frac{3a}{4\sqrt{2}}$

B. $\frac{1}{12\sqrt{2}a}$

C. $\frac{4\sqrt{2}}{3a}$

$$-4\sqrt{2}$$

D. $\frac{3a}{3a}$

Answer: C

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70. If $x = \cos\theta + \theta\sin\theta$, $y = \sin\theta - \theta\cos\theta$ then $\frac{d^2y}{dx^2} =$

A. $\frac{\operatorname{cosec}^3\theta}{\theta}$

B. $\frac{\sec^3\theta}{\theta}$

C. $\frac{\tan^3\theta}{\theta}$

D. $\frac{\cot^3\theta}{\theta}$

Answer: B

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71. If $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$ then $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{4}$ is

A. $\frac{\operatorname{cosec}^3\theta}{\theta}$

B. 2

C. $-2\sqrt{2}$

D. $\frac{2(3 - 2\sqrt{2})}{a}$

Answer: D



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72. If $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ then y_2 at $\theta = \pi/4$ is

A. $\frac{2(3 + 2\sqrt{2})}{b}$

B. $\frac{-2(3 + 2\sqrt{2})}{a}$

C. 0

D. 1

Answer: B



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73. $x = \cos\theta, y = \sin 5\theta \Rightarrow \left(1 - x^2\right) \frac{d^2y}{dx^2} - x \frac{dy}{dx} =$

A. $-5y$

B. $5y$

C. $25y$

D. $-25y$

Answer: D



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74. If $y = \frac{\log_e x}{x}$ and $z = \log_e x$, then $\frac{d^2y}{dz^2} + \frac{dy}{dz} =$

A. e^{-z}

B. $2e^{-z}$

C. ze^{-z}

D. $-e^{-z}$

Answer: D



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75. If $x = \sin^{-1}t, y = \sqrt{1-t^2}$ then $\frac{d^2y}{dx^2} =$

A. $-\sqrt{1-t^2}$

B. -1

C. t^2

D. none

Answer: A



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76. If $y = \left(\frac{1}{x}\right)^x$ then $y_1(1) =$

A. 1

B. -1

C. 0

D. none

Answer: C



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77. If $f(x) = \left(\frac{1}{x}\right)^x$ then $f' \left(\frac{1}{e}\right) =$

A. negative number

B. 0

C. positive number

D. none

Answer: A

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78. $\frac{d^2x}{dy^2}$ equals :

A. $\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$

B. $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

C. $\left(\frac{d^2y}{dx^2}\right)^{-1}$

D. $-\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$

Answer: B



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79. If $y^2 = p(x)$, a polynomial of degree 3, then $2 \frac{d}{dx} \left(y^3 \frac{d^2 y}{dx^2} \right)$ is equal to

A. $P''(x) + P'(x)$

B. $P'(x)P''(x)$

C. $P(x)P''(x)$

D. none

Answer: C



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80. Let $f(x)$ be a polynomial of degree 4 with $f(2) = -1, f'(2) = 0, f''(2) = 2, f'''(2) = -12, f^{(4)}(2) = 24$ then $f'(1) =$

A. 26

B. 13

C. 29

D. 62

Answer: A



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81. Let f be a twice differentiable function such that $f'(x) = f(x)$ and $f'(x) = g(x)$. If $h(x) = [f(x)]^2 + [g(x)]^2$, $h(1) = 8$ then $h(2) =$

A. 1

B. 2

C. 3

D. 8

Answer: D



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82. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is an even function having derivatives of all orders, then an odd function among the following is

A. f'

B. f''

C. $f + f'$

D. $f' + f''$

Answer: B



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83. If $f: \mathbb{R} \rightarrow \mathbb{R}$ is an even function which is twice differentiable on \mathbb{R} and $f'(\pi) = 1$, then $f'(-\pi) =$

A. -1

B. 0

C. 1

D. 2

Answer: C



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84. Let $f(x)$ be a twice differentiable function and $f''(0) = 2$, then

$$\lim_{x \rightarrow 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2} \text{ is}$$

A. a

B. 2a

C. 3a

D. 4a

Answer: C



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85. If $P(x)$ is a polynomial of 2nd degree and $P(2) = -1$, $P'(2) = 0$ and $p''(2) = 2$ then $P'(1) =$

A. 0

B. 1

C. 2

D. -2

Answer: D



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86. If $P(x)$ is polynomial of 3rd degree and $P''(1) = 0$, $P'''(1) = 6$ then $P''(0) =$

A. 0

B. 6

C. -6

D. none

Answer: C

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87. If $f(x) = u/v$ then $f'(x) =$

A. $\frac{1}{v^3}$

B. $\frac{1}{v^3} \begin{vmatrix} v & 0 & u \\ v_1 & v & u_1 \\ v_2 & 2v_1 & u_2 \end{vmatrix}$

C. v^3

D. none

Answer: B

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88. If $f(x) = x^n$ then $\sum_{r=0}^n \frac{f^{(r)}(1)}{r!} =$

A. 0

B. 2

C. $2n$

D. 2^n

Answer: D

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89. The n th derivative of $\log(ax + b)$ is

A. $\frac{(1 -)^{n-1}(n - 1)!a^n}{(ax + b)^n}$

B. $\frac{(-1)^n n! a^n}{(ax + b)^n}$

C. $\frac{(-1)^{n-1}(n-1)!a^{n-1}}{(ax+b)^n}$

D. none

Answer: A

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90. $f(x) = \sin x + \cos x \Rightarrow f\left(\frac{\pi}{4}\right) f^{(iv)}\left(\frac{\pi}{4}\right) =$

A. 1

B. 2

C. 3

D. 4

Answer: B

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91. The n th derivative of $\cos^4 x$ is

A. $2^{n-1} \cos\left(2x + \frac{n\pi}{2}\right) + 2^{2n-3} \cos\left(4x + \frac{n\pi}{2}\right)$

B. $2^n \cos\left(2x + \frac{n\pi}{2}\right) + 2^{2n-2} \cos\left(4x + \frac{n\pi}{2}\right)$

C. $2^{n+1} \cos\left(2x + \frac{n\pi}{2}\right) + 2^{2n-3} \cos\left(4x + \frac{n\pi}{2}\right)$

D. none

Answer: A



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92. $\frac{d^{20}}{dx^{20}} [2\cos x \cos 3x] =$

A. $2^{20} (\cos 2x - 2^{20} \cos 4x)$

B. $2^{20} (\cos 2x + 2^{20} \cos 4x)$

C. $2^{20} (\sin 2x + 2^{20} \sin 4x)$

D. $2^{20} (\sin 2x - 2^{20} \sin 4x)$

Answer: B



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Set 2

1. if $F(X) = \frac{1}{x}$ then $f'(1) = A$ 2. If $f(x) = \frac{x+1}{x+3}$ then $f'(-1) = B$
3. If $f(x) = x^2$ then $f'(1) = C$ 4. If $f(x) = \log x$ then $f'(3) = D$

The ascending order of A,B,C ,D is

A. B,A,C,D

B. B,D,A,C

C. A,D,B,C

D. A,B,C,D

Answer: C



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1. If $f(x) = x^x$ then $f'(e) = A$ 2. If $f(x) = \sin^{-1}x$ then $f'(1/2) = B$
 2. 3. If $f(x) = \tan^{-1}x$ then $f'(0) = C$ 4. If $f(x) = e^x$ then $f'(e) = D$

The ascending order of A,B,C,D is

A. C,B,D,A

B. B,C,D,A

C. A,B,C,D

D. D,C,B,A

Answer: A



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3.1 $\frac{d}{dx} (\cos^{-1}x + \sin^{-1}x) = A$

2. $\frac{d}{dx} \left[\tan^{-1} \left(\frac{1 + \sin x}{\cos x} \right) \right] = B$

2 If $f(x) = (x + \sqrt{x^2 + 1})$ then $f'(1) = C$

4 If $f(x) = \cos^{-1}(4x^3 - 3x)$ then $f'(0) = D$

The ascending order A,B,C,D is

A. D,A,C,B

B. A,B,C,D

C. A,D,C,B

D. B,C,A,D

Answer: D



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4. 1. If $x = at^2, y = 2at$ then $\frac{dy}{dx}at = 1$ is A

2 If $x = \cos\theta, y = \sin\theta$ then $\frac{dy}{dx}at = \frac{\pi}{4}$ is B

3 If $x = 1 - \cos\theta, y = \sin\theta$, then $\frac{dy}{dx}at = \frac{\pi}{6}$ is C

4 If $x = \log\sin\theta, y = \tan\theta$ then $\frac{dy}{dx}at = \frac{\pi}{4}$ is D.

The ascending order of A,B,C,D is

A. A,B,C,D

B. A,B,D,C

C. B,A,D,C

D. D,C,B,A

Answer: C



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Set 3

1. Match the following

$$\text{I. } \frac{d}{dx} \left\{ x\sqrt{a^2 - x^2} + a^2 \sin^{-1} \left(\frac{x}{a} \right) \right\} = \quad \text{a) } 2\sqrt{a^2 + x^2}$$

$$\text{II. } \frac{d}{dx} \left\{ x\sqrt{a^2 + x^2} + a^2 \sinh^{-1} \left(\frac{x}{a} \right) \right\} = \quad \text{b) } 2\sqrt{x^2 - a^2}$$

$$\text{III. } \frac{d}{dx} \left\{ x\sqrt{x^2 - a^2} - a^2 \cosh^{-1} \left(\frac{x}{a} \right) \right\} = \quad \text{c) } 2\sqrt{a^2 - x^2}$$

A. a,b,c

B. c,a,b

C. b,c,a

D. a,c,b

Answer: B



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2. Match the following

I. If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ then $\frac{dy}{dx} =$ a) $\tan \theta$

II. If $x = 3 \cos \theta - 2 \cos^3 \theta$, $y = 3 \sin \theta - 2 \sin^3 \theta$ then $\frac{dy}{dx} =$ b) $\cot \theta$

III. If $x = 3 \cos \theta - \cos^3 \theta$, $y = 3 \sin \theta - \sin^3 \theta$ then $\frac{dy}{dx} =$ c) $\cot \frac{\theta}{2}$

IV. If $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$ then $dy/dx =$ d) $-\cot^3 \theta$

A. a,b,c,d

B. c,d,b,a

C. c,b,d,a

D. b,a,d,c

Answer: C



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3. Match the following

I. If $x^2 + y^2 + 3xy = 7$ then $\frac{dy}{dx} =$

II. If $x^{2/3} + y^{2/3} = a^{2/3}$ then $\frac{dy}{dx} =$

III. If $x^3 + y^3 = 3axy$ then $\frac{dy}{dx} =$

IV. If $xy(x+y) = 2$ then $\frac{dy}{dx} =$

a) $\frac{-(2x+3y)}{3x+2y}$

b) $-\left(\frac{y}{x}\right)^{1/3}$

c) $\frac{x^2-ay}{ax-y^2}$

d) $\frac{-y(2x+y)}{x(x+2y)}$

A. a,b,c,d

B. c,d,b,a

C. c,b,d,a

D. b,a,d,c

Answer: A



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4. Match the following

I. $\frac{d}{dx} (\text{Cot}^{-1} (\text{cosec } x + \cot x))$

II. $\frac{d}{dx} \left(\frac{(3-x)\sqrt{x}}{1-3x} \right)$

III. $\frac{d}{dx} \left(1+x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots \infty \right) =$

IV. $\frac{d}{dx} \left(\text{Sin}^{-1} \left(\frac{1-x^2}{1+x^2} \right) \right) =$

a) e^x

b) $\frac{1}{2}$

c) $\frac{3}{2\sqrt{x}(1+x)}$

d) $\frac{3}{\sqrt{x} + x\sqrt{x}}$

e) $\frac{-2}{1+x^2}$

A. b,c,a,e

B. b,c,d,e

C. b,a,c,d

D. d,c,a,e

Answer: A



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5. Match the following

- I. If $\sin^{-1} x + \sin^{-1} y = \pi/2$ then dy/dx a) $-1/x^2$
II. $\tan^{-1} x + \tan^{-1} y = \pi/2$ then dy/dx b) $-x/y$
III. If $x^m y^n = (x + y)^{m+n}$ then dy/dx c) -1
IV. If $\sin(x + y) = \log(x + y)$ then dy/dx d) y/x
e) $-y/x$

A. b,a,c,d

B. b,a,d,c

C. a,b,c,d

D. b,a,c,e

Answer: B



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1. The derivative of $(\log x)^x$ w. r. to x is $(\log x)^{x-1} [1 + \log x \log(\log x)]$

$$R: \frac{d}{dx} \left\{ f(x)^{g(x)} \right\} \left[g(x) \frac{f'(x)}{f(x)} + g'(x) \log(f(x)) \right]$$

- A. Both A and R are true R is correct reason of A
- B. Both A and R are true R is not correct reason of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A

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2. A: If $y = x^y$ then $\frac{dy}{dx} = \frac{y^2}{x(1 - \log y)}$

If $y = f(x)^y$, then $\frac{dy}{dx} = \frac{y^2 f'(x)}{f(x)[1 - y \log f(x)]} = \frac{y^2 f'(x)}{f(x)[1 - \log y]}$

- A. Both A and R are true R is correct reason of A
- B. Both A and R are true R is not correct reason of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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3. A: If $y = \sqrt{\sin x + y}$ then $\frac{dy}{dx} = \frac{\cos x}{2y - 1}$

R: If $y = \sqrt{f(x) + y}$ then $\frac{dy}{dx} = \frac{f'(x)}{2y - 1}$.

A. Both A and R are true R is correct reason of A

B. Both A and R are true R is not correct reason of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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$$4. A: \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{a \cos x + b \sin x}{b \cos x - a \sin x} \right) \right\} = 1$$

$$R: \frac{d}{dx} \left\{ \tan^{-1} \left(\frac{a \cos f(x) + b \sin f(x)}{b \cos f(x) - a \sin f(x)} \right) \right\} = f'(x)$$

- A. Both A and R are true R is correct reason of A
- B. Both A and R are true R is not correct reason of A
- C. A is true but R is false
- D. A is false but R is true

Answer: A

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$$5. A: \text{If } f(x) = x \sin \left(\frac{1}{x} \right) (x \neq 0) \text{ and } f(0) = 0 \text{ then } f'(0) = 0$$

$$R: \lim_{x \rightarrow 0} \sin \left(\frac{1}{x} \right) \text{ does not exist}$$

- A. Both A and R are true R is correct reason of A

B. Both A and R are true R is not correct reason of A

C. A is true but R is false

D. A is false but R is true

Answer: D



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6. Let $f(x) = x|x|$ and $g(x) = \sin x$

Statement -1 $g \circ f$ is differentiable at $x = 0$ and its derivative is continuous at that point

Statement -2 $g \circ f$ is twice differentiable at $x = 0$.

A. Statement -1 is true, Statement-2 is true, Statement-2 is not a correct explanation for Statement-1

B. Statement-1 is true , Statement-2 is false

C. Statement-1 is false, Statement-2 is true

D. Statement-1 is true, Statement-2 is true, Statement-2 is a correct explanation for Statement-1

Answer: B



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