MATHS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

DIFFERENTIATION

Exercise 1 Topical Problems

1. A function $f(x) = \begin{cases} 1+x, & x \leq 2 \\ 5-x & ,x > 2 \end{cases}$ is

A. not continuous at x = 2

B. differentiable x = 2

C. continuous but not differentiable at x = 2

D. None of the above

Answer: C

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2. Consider the greatest integer function, defined by $f(x) = [x], 0 \leq x < 2$. Then,

A. f is derivable at x = 1

B. f is not derivable at x = 1

C. f is derivable at x = 1

D. None of the above

Answer: B

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3. Let $f(x) = x|x|, \forall x \in R$. Then,

A. f is derivable at x = 0

B. f is not derivable at x = 0

C. f is not continuous at x = 0

D. None of the above

Answer: A

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4. The function $f(x) = e^{|x|}$ is

A. continuous everywhere but not differentiable at x = 0

B. continuous and differentiable everywhere

C. not continuous at x = 0

D. None of the above

Answer: A

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5. Let $f(x) = \begin{cases} x^n \sin. \frac{1}{x} & ,x \neq 0 \\ 0 & ,x = 0 \end{cases}$, then f(x) is continuous but not differentiable at x = 0, if

A. $n \in (0, 1)$

B. $n \in [1, \infty)$

C. $(-\infty, 0)$

D. $n = 0$

Answer: A

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6. The function $f(x) = \begin{cases} e^{2x} - 1 & ,x < 0 \\ ax + \frac{bx^2}{2} - & ,x < 0 \end{cases}$ continuous and differentiable for

A. $a = 1, b = 2$

B. $a = 2, b = 1$

C. $a = 2$, any b

D. any a, $b = 4$

Answer: C

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7. Let $f(x) = \begin{cases} \frac{1}{|x|} & \text{for } |x| > 1 \\ ax^2 + b & \text{for } |x| < 1 \end{cases}$ If f(x) is continuous and differentiable at any point, then

A. $a = \frac{1}{2}, b = -\frac{3}{2}$

B. $a = -\frac{1}{2}, b = \frac{3}{2}$

C. $a = 1, b = -1$

D. $a = b = 1$

Answer: B

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8. For the function f(x)=$\begin{cases} |x-3| & x \geq 1 \\ \frac{x^2}{4} - \frac{3x}{2} + \frac{13}{4} & x < 1 \end{cases}$ which one of the folllowing is incorrect

A. continuous and differentiable at x = 3

B. continuous at x = 3, but not differentiable at x = 3

C. continuous and differentiable everywhere

D. continuous at x = 1, but not differentiable at x = 1

Answer: B

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9. If $f(x) = \frac{x-1}{2x^2-7x+5}$ for $x \neq 1$ and $f(x) = -\frac{1}{3}$ for $x = 1$ then $f'(1) =$

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

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

C. -13

D. $1/3$

Answer: B

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10. If $f(x) = \{ax^2 + b, x \leq 1 \text{ and } bx^2 + ax + c, x > 1; b \neq 0,$ then $f(x)$ is continuous and differentiable at $x = 1$ if

A. $c = 0, a = 2b$

B. $a = b, c \in R$

C. $a = b, c = 0$

D. $a = b, c \neq 0$

Answer: A

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11. If f(x)=$\begin{cases} x-5 \text{for} & x \leq 1 \\ 4x^2-9 \text{for} & 1<x<2 \text{then} \\ 3x+4 \text{for} & x \geq 2 \end{cases}$ $f'(2')$

A. 0

B. 2

C. 3

D. 4

Answer: C

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12. Suppose f(x) is differentiable at x = 1 and $\lim_{h \to 0} \frac{1}{h} f(1+h) = 5$, then f'(1) equal to

A. 6

B. 5

C. 4

D. 3

Answer: B

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Exercise 1 Derivative Of Composite Function By Chain Rule

1. If $f(x) = \log_x(\log_e x)$, then $f'(x)$at $x = e$ is equal to

A. 1

B. 2

C. 0

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

Answer: D

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2. The derivative of $f(x) = (2x+1)^3$ is

A. $3(2x+1)^2$

B. $6(2x+1)^2$

C. $3(2x+1)$

D. None of these

Answer: B

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3. If $y = 2^{\log x}$, then $\frac{dy}{dt}$ is

A. $\frac{2^{\log x}}{\log 2}$

B. $2^{\log x}.\log_e 2$

C. $\frac{2^{\log x}}{x}$

D. $\frac{2^{\log x}.\log_e 2}{x}$

Answer: B

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4. If $y = e^x . e^{x^2} . e^{x^3} ..... e^{x^n} ....$ for `0

A. e

B. 4e

C. 2e

D. 3e

Answer: B

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5. The derivative of $\tan(x^\circ + 45^\circ)$, is

A. $\frac{\pi}{180}\sec^2(x^\circ + 45^\circ)$

B. $\sec^2\left(x^2+45^\circ\right)$

C. $\frac{180}{\pi}\sec^2(x^\circ+45^\circ)$

D. None of these

Answer: A

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6. If $y=\log\left(\frac{\cos x}{1-\sin x}\right)$, then $\frac{dy}{dx}$ is equal to

A. tanx

B. cosec x

C. cos x

D. sec x

Answer: D

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7. If $y = \log\left(\sqrt{x-1} - \sqrt{x+1}\right)$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: A

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8. The derivative of $f(x) = e^{e^{x^2}}$ is

A. $2xe^{x^2}$

B. $e^{e^{x^2}}e^{x^2}$

C. $2xe^{e^{x^2}}e^{x^2}$

D. None of these

Answer: C

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9. If $y = \log\left[x + \sqrt{9 + x^2}\right]$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: A

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10. If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, then $2x.\ \frac{dy}{dx}$ is equal to

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

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

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

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

Answer: C

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11. Derivative of $2\sqrt{\cot\left(x^2\right)}$ with respect to x is

A. $\frac{x \quad \text{cosec}^2\left(x^2\right)}{2\sqrt{\cot\left(x^2\right)}}$

B. $\frac{-2x \quad \text{cosec}^2\left(x^2\right)}{\sqrt{\cot\left(x^2\right)}}$

C. $\frac{-x \quad \text{cosec}^2\left(x^2\right)}{\sqrt{\cot\left(x^2\right)}}$

D. None of these

Answer: B

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12. Derivative of $\sqrt{\tan\sqrt{x}}$ with respect to x is

A. $\dfrac{\sec^2\sqrt{x}}{4\sqrt{x}\sqrt{\tan\sqrt{x}}}$

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

C. $\dfrac{\sec^2\sqrt{x}}{\sqrt{x}\sqrt{\tan\sqrt{x}}}$

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

Answer: A

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13. If $f(x)=\sqrt{1+\cos^2\left(x^2\right)}, then f'\left(\dfrac{\sqrt{\pi}}{2}\right)$ is $\dfrac{\sqrt{\pi}}{6}$ (b) $-\sqrt{\pi/6}\,1/\sqrt{6}$ (d) $\pi/\sqrt{6}$

A. $\dfrac{\sqrt{\pi}}{6}$

B. $-\sqrt{\dfrac{\pi}{6}}$

C. $\dfrac{1}{\sqrt{6}}$

D. $\frac{\pi}{\sqrt{6}}$

Answer: B

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14. If $y = \sqrt{\sin + y} \text{then} \frac{dy}{dx}$ is equal to

A. $\frac{\cos x}{2y - 1}$

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

C. $\frac{\sin x}{1 - 2y}$

D. $\frac{\sin x}{2y - 1}$

Answer: A

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15. The differential coefficient of $\sin\left(\cos\left(x^2\right)\right)$ with respect to s is .

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

B. $2x\sin\left(x^2\right)\cos\left(x^2\right)$

C. $2x\sin\left(x^2\right)\cos\left(x^2\right)\cos x$

D. None of the the above

Answer: A

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16. If $y=\sqrt{x(\log)_e x}$, then find $\frac{dy}{dx}$ at $x=e$.

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

B. $\frac{1}{\sqrt{e}}$

C. $\sqrt{e}$

D. e^2

Answer: B

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17. If $y = \left(\cos x^2\right)^2$, then $\frac{dy}{dx}$ is equal to

A. $-4x \sin 2x^2$

B. $-x \sin x^2$

C. $-2x \sin 2x^2$

D. $-x \cos 2x^2$

Answer: C

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18. If $y = \cos\left(\sin x^2\right)$ then at $x = \sqrt{\frac{\pi}{2}}$, $\frac{dy}{dx} =$

A. -2

B. 2

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

D. 0

Answer: D

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19. Derivative of $\log\left[\log\left(\log x^5\right)\right]$ with respect to x is

A. $\frac{1}{x\log x\log\left(\log x^5\right)}$

B. $\frac{1}{x\log\left(\log x^5\right)}$

C. $\frac{5}{x\log\left(\log x^5\right)}$

D. None of these

Answer: A

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20. If $f(x) = \log_{x^2}(\log_e x)$ then f' (x) at x= e is

A. 1

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

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

D. 0

Answer: C

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21. If $y = \log_2 \log_2(x), \quad \text{then} \quad \frac{dy}{dx}$ is equal to

A. $\frac{\log_2 e}{\log_e x}$

B. $\frac{\log_2 e}{x \log_x 2}$

C. $\frac{\log_2 x}{\log_e 2}$

D. $\frac{\log_2 e}{x \log_e x}$

Answer: D

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22. If $x = \frac{1-\sqrt{y}}{1+\sqrt{y}}$ then $\frac{dy}{dx}$ is equal to

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

B. $\frac{4(x-1)}{(1+x)^3}$

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

D. $\frac{4}{(x+1)^3}$

Answer: B

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23. If $y = \log(\sin(x^2)), 0 < x < \frac{\pi}{2}$, then $\frac{dy}{dx}$ at $x = \frac{\sqrt{\pi}}{2}$ is

A. 0

B. 1

C. $\frac{\pi}{4}$

D. $\sqrt{\pi}$

Answer: D

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24. $\frac{d}{dx}\left[\log_e e^{\sin(x^2)}\right]$ is equal to

A. $2\cos\left(x^2\right)$

B. $2\cos x$

C. $2x.\cos x$

D. $2x\cos\left(x^2\right)$

Answer: D

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25. If $y = \sqrt{\frac{1-x}{1+x}}$, then $\left(1-x^2\right)\frac{dy}{dx} + y$ is equal to

A. 1

B. -1

C. 2

D. 0

Answer: D

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26. Differential coefficient of $\sqrt{\sec\sqrt{x}}$ is

A. $\frac{1}{4\sqrt{x}}\sec\sqrt{x}\sin\sqrt{x}$

B. $\frac{1}{4\sqrt{x}}\left(\sec\sqrt{x}\right)^{3/2}.\sin\sqrt{x}$

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

D. $\frac{1}{2}\sqrt{x}\left(\sec\sqrt{x}\right)^{3/2}.\sin\sqrt{x}$

Answer: B

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27. $\frac{d}{dx}\left[\log\left\{e^x\left(\frac{x-2}{x+2}\right)^{3/4}\right\}\right]$ is equal to

A. 1

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

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

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

Answer: C

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28. Derivative of $\sqrt{e}^{\sqrt{x}}$ with respect to x is

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

B. $\frac{4e^{\sqrt{x}}}{\sqrt{xe}^{\sqrt{x}}}$

C. $\frac{e^{\sqrt{x}}}{4\sqrt{xe}^{\sqrt{x}}}$

D. $\frac{e^{\sqrt{x}}}{\sqrt{e}^{\sqrt{x}}}$

Answer: C

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29. The derivative of $y = \sec^{-1}\left(\frac{1}{8x}\right)$ is

A. $\frac{8}{1+64x^2}$

B. $-\frac{8}{1+64x^2}$

C. $-\frac{8}{\sqrt{1-64x^2}}$

D. None of these

Answer: C

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30. If $y = \sin^{-1}(\cos x)$, then derivative of y is

A. -1

B. 0

C. 1

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

Answer: A

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Exercise 1 Derivative Of Inverse Trigonometric Functions By Substitution

1. If $y = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: B

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2. If $-\frac{1}{\sqrt{3}} < x < \frac{1}{\sqrt{3}}, then \frac{\tan^{-1}(3x - x^3)}{1 - 3x^2}$ equals

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

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

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

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

Answer: A

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3. If $y = \sin^{-1}\left(\frac{1 - x^2}{1 + x^2}\right), 0 < x < 1$ then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: B

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4. Prove that : `cot^(-1)(sqrt(1+sinx)+sqrt(1-sinx))/(sqrt(1+sinx)-sqrt(1-sinx))=x/2,0

A. 0

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

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

D. None of these

Answer: B

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5. Differentiate the functions with respect to x: `cos^(-1){(cosx+sinx)/(sqrt(2))},-pi/4

A. 0

B. 1

C. -1

D. 2

Answer: C

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6. Derivative of $\sin^{-1}\left(\frac{1}{\sqrt{x+1}}\right)$ with respect to x is

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

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

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

D. None of these

Answer: C

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7. If $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{2}$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: B

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8. $\frac{d}{dx}\left[\sin^{-1}\left(x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\right)\right]$ is equal to

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

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

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

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

Answer: C

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9. If $y = \cos^{-1}\left(\frac{2x}{1+x^2}\right), \ -1 < x < 1$ then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: C

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10. If $y = \sin^{-1} x + \sin^{-1} \sqrt{1 - x^2}, \ -1 \leq x \leq 1, \quad \text{then} \quad \frac{dy}{dx}$ is

A. 0

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

C. 1

D. 4

Answer: A

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

A. 2

B. -2

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

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

Answer: D

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12. $\frac{d}{dx}\left[\sin^2 \cot^{-1}\sqrt{\frac{1-x}{1+x}}\right]$ is

A. -1

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

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

D. 1

Answer: B

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13. If $y = \tan^{-1} x + \cot^{-1} x + \sec^{-1} + \text{cosec}^{-1} x$. then $\frac{dy}{dx}$ is equal to

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

B. π

C. 0

D. 1

Answer: C

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14. If $y = \sin^{-1}\sqrt{1-x}$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: D

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15. If $y = \tan^{-1}\left(\frac{\cos x}{1+\sin x}\right)$, then $\frac{dy}{dx}$ is equal to

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

B. 2

C. -2

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

Answer: D

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16. If $y = \sin\left[\cos^{-1}\left\{\sin\left(\cos^{-1} x\right)\right\}\right]$, then $\frac{dy}{dx}$ at $x = \frac{1}{2}$

A. 0

B. -1

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

D. 1

Answer: D

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17. If $y = \tan^{-1}\sqrt{\frac{1-\sin x}{1+\sin x}}$, then the value of $\frac{dy}{dx} atx = \frac{\pi}{6}$ is

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

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

C. 1

D. -1

Answer: A

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18. The derivative of $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)$ is

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

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

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

D. x

Answer: C

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Exercise 1 Derivative Of Function With Respect To Another Function

1. The derivative of e^{3x+4} w.r.te e^{4x} is

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

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

C. $\frac{3}{4}e^{x-4}$

D. $\frac{4}{3}e^{x-4}$

Answer: A

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

A. $-\sin x^3$

B. $\sin x^3$

C. $-3x^2 \sin x^3$

D. None of these

Answer: A

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3. The value of differentiation of e^{x^2} with respect to e^{2x-1}

at x = 1 is

A. e

B. 0

C. e^{-1}

D. 1

Answer: D

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4. Derivative of $\log_{10} x$ with respect to x^2 is

A. $2x^2 \log_e 10$

B. $\frac{\log_{10} e}{2x^2}$

C. $\frac{\log_e 10}{2x^2}$

D. $x^2 \log_e 10$

Answer: B

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5. The derivative of $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ with respect to ltbr. $\sin^{-1}\left(3x-4x^3\right)$ is

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

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

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

D. 1

Answer: A

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6. The derivative of $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ with respect to $\cos^{-1}\sqrt{1-x^2}$ is

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

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

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

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

Answer: D

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7. The differential coefficient of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\tan^{-1}x$ is equal to.....

A. 1

B. 2

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

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

Answer: D

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8. The derivative of $\sin\left(x^3\right)$ w.r.t.$\cos\left(x^3\right)$ is

A. $-\tan\left(x^3\right)$

B. $\tan\left(x^3\right)$

C. $-\cot\left(x^3\right)$

D. $\cot\left(x^3\right)$

Answer: C

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9. The derivative of $a^{\sec x}$ $\text{w.r.t.} a^{\tan x}(a>0)$ is

A. $\sec x a^{\sec x-\tan x}$

B. $\sin x a^{\tan x-\sec x}$

C. $\sin x a^{\sec x-\tan x}$

D. $a^{\sec x-\tan x}$

Answer: C

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10. Differential coefficient of $\frac{\sec^{-1}(1)}{2x^2-1}$ with respect to $\sqrt{1-x^2}$ at $x = \frac{1}{2}$ is equal to

A. 2

B. 4

C. 6

D. 1

Answer: B

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Exercise 1 Logarithmic Differentiation

1. If $y = x^{\sqrt{x}}$, then $\frac{dy}{dx}$ is equal to

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

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

C. $\frac{y}{\sqrt{x}}(2 - \log x)$

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

Answer: B

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2. If u, v and w are functions of x, then show that $\frac{d}{dx}(u\dot{v}\dot{w}) = \frac{du}{dx}v\dot{w} + u\frac{\dot{dv}}{dx}\dot{w} + u\dot{v}\frac{dw}{dx}$ in two ways - first by repeated application of product rule, second by logarithmic differentiation.

A. $\frac{du}{dx}uw - u\frac{dv}{dx}w + uv\frac{dw}{dx}$

B. $-\frac{du}{dx}uw + uv\frac{dw}{dx} + u\frac{dw}{dx}w$

C. $\frac{du}{dx}vw + u\frac{dw}{dx}w + uv\frac{dw}{dx}$

D. None of the above

Answer: C

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3. If $x^y = e^{2(x-y)}$, then $\frac{dy}{dx}$ is equal to

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

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

C. $\frac{2}{2+\log x}$

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

Answer: A

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4. If $y = \log x^x$, then the value of $\frac{dy}{dx}$ is

A. $x^x(1+\log x)$

B. $\log(ex)$

C. $\log\left(\frac{e}{x}\right)$

D. $\log\left(\frac{x}{e}\right)$

Answer: B

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5. $\frac{d}{dx}[x^x + x^a + a^x + a^a] = \ldots$, a is constant

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

B. $x^x(1+\log x) + a.\, x^{a-1} + a^x \log a$

C. $x^x(1+\log x) + a^a(1+\log a)$

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

Answer: B

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6. If $y = x^{1/x}$, then the derivative of y is

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

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

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

D. None of these

Answer: A

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7. The derivation of $\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}$ with respect to x is a .

A. $\frac{1}{2}\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}\left[\frac{1}{x-3} + \frac{2x}{x^2+4} - \frac{6x+4}{3x^2+4x+5}\right]$

B. $\frac{1}{2}\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}\left[\frac{1}{x-3} - \frac{2x}{x^2+4} + \frac{6x+4}{3x^2+4x+5}\right]$

C. $\frac{1}{2}\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}\left[\frac{1}{x-3} - \frac{2x}{x^2+4} - \frac{6x+4}{3x^2+4x+5}\right]$

D. None of the above

Answer: A

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8. If $(\cos x)^y = (\cos y)^x$, then $\frac{dy}{dx}$ is equal to

A. $\frac{\log(\cos y) + y(\tan x)}{\log(\cos x) + x \tan y}$

B. $\frac{\log(\cos y) - y(\tan x)}{\log(\cos x) - x(\tan y)}$

C. $\frac{\log(\tan x) + y(\cos y)}{\log(\cos x) + x(\tan y)}$

D. None of these

Answer: A

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9. If $f(x) = (1+x)\left(1+x^2\right)\left(1+x^4\right)\left(1+x^8\right)$, then f'(1) is

A. 130

B. 120

C. 110

D. None of these

Answer: B

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10. If $y = \sqrt{\frac{(x-1)(x-2)}{(x-3)(x-4)(x-5)}}$ then $\frac{dy}{dx}$ is equal to

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

$\left\{\frac{1}{x-3}+\frac{1}{x-2}-\frac{1}{x-3}-\frac{1}{x-4}-\frac{1}{x-5}\right\}$

B. $\frac{1}{2}\sqrt{\frac{(x-1)(x-2)}{(x-3)(x-4)(x-5)}}$

$\left\{\frac{1}{x-3}-\frac{1}{x-2}+\frac{1}{x-3}+\frac{1}{x-4}+\frac{1}{x-5}\right\}$

C. $\frac{1}{2}\sqrt{\frac{(x-1)(x-2)}{(x-3)(x-4)(x-5)}}$

$\left\{\frac{1}{x-3}-\frac{1}{x-2}+\frac{1}{x-3}-\frac{1}{x-4}+\frac{1}{x-5}\right\}$

D. None of the above

Answer: A

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11. Derivative of $(x+3)^2(x+4)^3(x+5)^4$ with respect to x is .

A. $(x+3)(x+4)(x+5)^2(9x^2+70x+133)$

B. $(x+3)(x+4)^2(x+5)^3(9x^2+70x+133)$

C. $(x+3)(x+4)^2(x+5)(9x^2-70x-133)$

D. None of the above

Answer: B

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12. If $y^x = x^y$, then $\frac{dy}{dx}$ is equal to

A. $\frac{y}{x}\left(\frac{y+x\log y}{x-y\log x}\right)$

B. $\frac{y}{x}\left(\frac{y-x\log y}{x-y\log x}\right)$

C. $\frac{y}{x}\left(\frac{y+x\log y}{x+y\log x}\right)$

D. None of these

Answer: B

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13. If $y=(1+x)\left(1+x^2\right)\left(1+x^4\right)\left(1+x^{2n}\right)$, then find $\frac{dy}{dx}atx=0.$

A. 0

B. -1

C. 1

D. 2

Answer: C

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14. Let $f(x) = (x-2)(x-4)(x-6)...(x-2n)$ then $f'(2)$ equals

A. $(-1)^n 2^{n-1}(n-1)!$

B. $(-2)^{n-1}(n-1)!$

C. $(-2)^n n!$

D. $(-1)^{n-1}2^n(n-1)!$

Answer: B

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15. If $y = \left(1+\frac{2}{x}\right)\left(1+\frac{2}{x}\right)\left(1+\frac{3}{x}\right)...\left(1+\frac{n}{x}\right)$ $x \neq 0$, then $\frac{dy}{dx}$ when x = - 1 is

A. $n!$

B. $(n-1)!$

C. $(-1)^n(n-1)!$

D. $(-1)^n n!$

Answer: C

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16. Let $y = x^{x^{x \ldots \infty}}$, then $\frac{dy}{dx}$ is equal to

A. yx^{y-1}

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

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

D. `None of these

Answer: B

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17. If $f(x) = \cos x \cos 2x \cos 4x \cos(8x).\cos 16x$ then find $f'\left(\frac{\pi}{4}\right)$

A. $\sqrt{2}$

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

C. 0

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

Answer: C

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Exercise 1 Derivative Of Implicit Function

1. If $y + \sin y = \cos x, then \frac{dy}{dx}$ is equal to

A. $-\frac{\sin x}{1+\cos y}, y = (2n+1)\pi$

B. $\frac{\sin x}{1+\cos y}, y \neq (2n+1)\pi$

C. $-\frac{\sin x}{1+\cos y}, y \neq (2n+1)\pi$

D. None of the above

Answer: C

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2. If $\sec^{-1}\left(\frac{1+x}{1-y}\right) = a, \quad \text{then} \quad \frac{dy}{dx}$ is

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

B. $\frac{y+1}{x-1}$

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

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

Answer: A

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

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: A

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4. If $x^4+y^4=3xy$, then $\frac{dy}{dx}$ is equal to

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

B. $\frac{4x^3-3y}{4y^33x}$

C. $\frac{3y-4x^3}{4y^3-3x}$

D. $\frac{4y^3-3x}{3y-4x^3}$

Answer: C

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5. If $x = \frac{y}{\sin y}$, then $\frac{dy}{dx}$

A. $\frac{y}{x(1 - x\cos y)}$

B. $\frac{x}{y(x\cos y - 1)}$

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

D. None of these

Answer: A

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6. If $y = x^2.\, e^{xy}$ then derivative of y is

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

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

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

D. None of these

Answer: B

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7. If $x\sqrt{1+y}+y\sqrt{1+x}=0$, for, `-1

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

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

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

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

Answer: D

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8. यदि $\cos y = x\cos(a+y)$, तथा $\cos a \neq \pm 1$, तो सिध्य कीजिये कि $\frac{dy}{dx} = \frac{\cos^2(a+y)}{\sin a}$

A. $\frac{\sin a}{\cos^2(a+y)}$

B. $\frac{\sin^2(a+y)}{\sin a}$

C. $\frac{\cos^2(a+y)}{\sin a}$

D. $\frac{\cos^2(a+y)}{\cos a}$

Answer: C

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9. If $3\sin(xy) + 4\cos(xy) = 5$, then $\frac{dy}{dx}$ is equal to

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

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

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

D. None of these

Answer: A

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10. $If \sin^2 x + \cos^2 y = 1, \quad \text{then} \quad \frac{dy}{dx}$ is equal to

A. $\frac{\sin 2x}{\sin 2y}$

B. $\frac{\sin^2 y}{\sin 2x}$

C. $\frac{\sin^2 x}{\sin^2 y}$

D. $\frac{\sin^2 y}{\sin^2 x}$

Answer: A

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11. If $\sin(a+y) + \sin a.\cos(a+y) = 0.$ Prove that : $\frac{dy}{dx} = \left(\frac{\sin^2(a+y)}{\sin a}\right)$

A. $\frac{\sin^2(a+y)}{\sin a}$

B. $\frac{\cos^2(a+y)}{\cos a}$

C. $\frac{\sin^2(a+y)}{\cos a}$

D. $\frac{\cos^2(a+y)}{\sin a}$

Answer: A

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

Then $y'(1)$ equals: 1 b. $\log 2$ c. $-\log 2$ d. -1

A. -1

B. 1

C. log 2

D. - log 2

Answer: A

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13. If $2^x + 2^y = 2^{x+y}$, then $\frac{dy}{dx}$ is equal to $-\frac{2^y}{2^x}$ (b) $\frac{1}{1-2^x}$ $1-2^y$ (d) $\frac{2^x(1-2^y)}{2^y(2^x-1)}$

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

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

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

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

Answer: C

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14. If $x^{2/3} + y^{2/3} = a^{2/3}$, then $\frac{dy}{dx}$ is equal to

A. $-\sqrt[3]{\frac{y}{x}}$

B. $-\sqrt[3]{y/x}$

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

D. None of these

Answer: A

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15. If $x = \frac{1+\log t}{t^2}$, $y = \frac{3+2\log t}{t}$, find $\frac{dy}{dx}$.

A. $\tan\theta$

B. $\cot\theta$

C. $\sin\theta$

D. $\cos\theta$

Answer: A

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16. If $x = \frac{1+\log t}{t^2}$, $y = \frac{3+2\log t}{t}$, find $\frac{dy}{dx}$.

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

B. -1

C. 1

D. t

Answer: D

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17. If $x = a\sec^3\theta and y = a\tan^3\theta$, $f \in d\frac{dy}{dx}ah\eta = \frac{\pi}{3}$.

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

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

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

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

Answer: C

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18. If $x = a\left(\cos t + (\log \tan)\frac{1}{2}\right), y = a\sin t,$ then $\frac{dy}{dx}$ is equal to

A. cot t

B. tan t

C. sec t

D. cosec t

Answer: B

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19. If $x = t + \frac{1}{t}$ and $y = t - \frac{1}{t}$. then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: A

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20. If $x^2 + y^2 = \left(t + \frac{1}{t}\right)$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \frac{dy}{dx} =$

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

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

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

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

Answer: B

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21. If $x = -a(\theta - \sin\theta), y = a(1 - \cos\theta),$ then $\frac{dy}{dx}$ is

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

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

C. $\frac{1}{2}\text{cosec}^2\frac{\theta}{2}$

D. $-\frac{1}{2}\text{cosec}^2\frac{\theta}{2}$

Answer: A

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Exercise 1 Higher Order Derivative

1. If $f(x) = x^{1/x}, then: f''(e)$ is

A. 1

B. e

C. $-e^{1/3}$

D. $-e^{\frac{1}{e}-3}$

Answer: D

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2. If $y = 3\cos(\log x) + 4\sin(\log x)$, show that $x^2 y_2 + x y_1 + y = 0$

A. y

B. $= -xy$

C. -y

D. y

Answer: C

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3. If $y = 1 - x + \frac{x^2}{2!} - \frac{x^3}{3!} + \frac{x^4}{4!} - \ldots,$ then $\frac{d^2y}{dx^2}$ is equal to

A. x

B. $-x$

C. $-y$

D. y

Answer: D

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4. If $y = 500\, e^{7x} + 600\, e^{-7x}$, show that $\frac{d^2y}{dx^2} = 49\, y$.

A. y

B. 7y

C. 40y

D. 49 y

Answer: D

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5. If $y = \left(\tan^{-1} x\right)^2$, then prove that $\left(1+x^2\right)^2 y_2 + 2x\left(1+x^2\right)y_1 = 2$

.

A. 0

B. 1

C. 2

D. 4

Answer: C

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6. If $x = \sin t$ and $y = \sin pt$, prove that $\left(1-x^2\right)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + p^2 y = 0.$

A. $-y$

B. y

C. py

D. $-p^2y$

Answer: D

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7. If $x = a(1+\cos\theta)$, $y = a(\theta+\sin\theta)$, prove that $\frac{d^2y}{dx^2} = \frac{-1}{a}$ at $\theta = \frac{\pi}{2}$.

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

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

C. -1

D. -2

Answer: A

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8. If $f(x) = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}x^3 + \ldots + x^n$, then $f''(1)$ is equal to

A. $n(n-1)2^{n-1}$

B. $(n-1)2^{n-1}$

C. $n(n-1)2^{n-2}$

D. $n(n-1)2^n$

Answer: C

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9. if $x = \log_e t, t > 0$ and $y + 1 = t^2$ then $\frac{d^2y}{dx^2}$

A. $4e^{2x}$

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

C. $-\frac{3}{4}e^{5x}$

D. $4e^x$

Answer: B

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10. If $f(x) = be^{ax} + ae^{bx}$, then f''(0) is equal to

A. 0

B. 2ab

C. $ab(a + b)$

D. ab

Answer: C

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11. Let $f(x) = \sin x$, $g(x) = x^2$ and $h(x) = \log_e x$.

If $F(x) = (\text{hog of })(x)$, then $F''(x)$ is equal to

A. $a\text{cosec}^3 x$

B. $2\cot x^2 - 4x^2\text{cosec}^2 x^2$

C. $2x\cot x^2$

D. $2\text{cosec}^2 x$

Answer: D

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12. If $y = x\log\left(\frac{x}{a+bx}\right)$, then $\frac{x^3 d^2y}{ax^2}$ is equal to

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

B. $\left(x\frac{dy}{dx} - y\right)^2$

C. $y\frac{dy}{dx} - x$

D. None of these

Answer: B

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13. if $f(x) = x^n$ then the value of $f(1) - \frac{f'(1)}{1!} + \frac{f''(1)}{2!} + - - - + \frac{(-1)^n f''^{--n} \times (1)}{n!}$

A. 2^n

B. 2^{n-1}

C. 0

D. 1

Answer: C

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14. If $(x-a)^2+(y-b)^2=c^2$, for some $c>0$, $prove that \frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}} is a constant \in dependen \to f$ a and b.

A. $-c$

B. $-\frac{c}{a}$

C. $-\frac{a}{c}$

D. $-abc$

Answer: A

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15. If $y=e^{a\cos^{-1}}, -1\leq x\leq 1,$ the which of these are correct ?

A. $\left(1-x^2\right)\frac{d^2y}{dx^2}-x\frac{dy}{dx}+a^2y=0$

B. $\left(1-x^2\right)\frac{d^2y}{dx^2}+x\frac{dy}{dx}-a^2y=0$

C. $\left(1-x^2\right)\frac{d^2y}{dx^2}-x\frac{dy}{dx}-a^2y=0$

D. None of the above

Answer: C

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Exercise 2 Miscellaneous Problems

1. Given $y = \sqrt{a}^{\sqrt{x}}$, $\text{then} \frac{dy}{dx}$ is equal to

A. $\frac{y}{2} \frac{\sqrt{a}^{\sqrt{x}} \log a}{4y\sqrt{x}}$

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

C. $\frac{\sqrt{a}^{\sqrt{x}} \log a}{4y\sqrt{x}}$

D. $s^{\sqrt{x}} \log a$

Answer: C

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2. If $y = \frac{\tan^{-1}(x)}{2} - \frac{\cot^{-1}(x)}{2}$, then $\frac{dy}{dx}$ is equal to

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

B. $\frac{8}{4+x^2}$

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

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

Answer: C

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3. If $y = \left(\frac{x^a}{x^b}\right)^{a+b}\left(\frac{x^b}{x^c}\right)^{b+c}\left(\frac{x^c}{x^a}\right)^{c+a}$, then $\frac{dy}{dx}$ is equal to

A. 0

B. $a+b+c$

C. 1

D. None of these

Answer: A

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4. If $f(x) = 3^x$ and $g(x) = 4^x$, then $\frac{f'(0) - g'(0)}{1 + f'(0)g'(0)}$ is

A. $\frac{\log \frac{3}{4}}{1 + (\log 3)(\log 4)}$

B. $\frac{\log \frac{3}{4}}{1 + \log 12}$

C. $\frac{\log 12}{1 + \log_{12}}$

D. None of these

Answer: A

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5. If $y = \sqrt{\frac{1 + \sin x}{1 + \cos x}}$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: B

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6. If $y = \tan^{-1}\left(\frac{4\sqrt{x}}{1-4x}\right)$ then $\frac{dy}{dx}$ is

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

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

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

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

Answer: D

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7. If $y = \tan^{-1}\left(\frac{4\sqrt{x}}{1-4x}\right)$ then $\frac{dy}{dx}$ is

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

B. $\frac{2^x \log 8}{1+4^x}$

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

D. None of the above

Answer: C

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

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

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

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

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

Answer: C

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9. If $y = \tan^{-1}\left(\frac{\sin 3x - \cos 3x}{\sin 3x + \cos 3x}\right)$ then $\frac{dy}{dx} =$

A. 0

B. 2

C. 1

D. 3

Answer: D

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10. If $y = \log_a x + \log_x a + \log_x x + \log_a a$, then $\frac{dy}{dx}$ is equal to

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

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

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

D. None of these

Answer: D

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11. If $x = e^{x/y}$, then $\frac{dy}{dx}$ is equal to

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

B. $\frac{y - x}{\log x}$

C. $\frac{y - x}{x \log x}$

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

Answer: A

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12. If $f(x) = \log\left(\frac{m(x)}{n(x)}\right), m(1) = n(1) = 1$ and $m'(1) = n'(1) = 2, \quad \text{then} f'(1)$ is equal to

A. 0

B. 1

C. -1

D. None of these

Answer: A

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13. If $y = t^2 + t - 1 \quad \text{then} \quad \frac{dy}{dx}$ is equal to

A. $2t + 1$

B. 0

C. $t^2 + t - 1$

D. Not defined

Answer: B

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

A. -1

B. 0

C. 1

D. 2

Answer: C

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15. If $y = \sqrt{x(\log)_e x}$, then find $\frac{dy}{dx}$ at $x = e$.

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

B. $\sqrt{e}$

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

D. None of these

Answer: C

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16. $Lety = e^{2x}\dot{T}hen\left(\frac{d^2y}{dx^2}\right)\left(\frac{d^2x}{dy^2}\right)is(A)1(B)e^{-2x}(C)2e^{-2x}$

A. 1

B. e^{-2x}

C. $2e^{-2x}$

D. $-2e^{-2x}$

Answer: C

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17. If $f(x) = |x-2|$ and $g(x) = f(f(x)), then g'(x) for \ \ x > 20, is$

A. -1

B. 0

C. 1

D. 2

Answer: C

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18. If $y = \frac{a + bx^{\frac{3}{2}}}{x^{\frac{5}{4}}} and y' = 0 at x = 5,$ then the value of $\frac{a^2}{b^2}$ is_____

A. $\sqrt{5}:1$

B. $5:2$

C. $3:5$

D. $1:2$

Answer: A

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19. The value of $\frac{d}{dx}(|x-1|+|x-5|)$ at x = 3 is

A. -2

B. 0

C. 2

D. 4

Answer: B

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20. If $y = f(x)$ and $y\cos x + \cos y = \pi$, then the value of f''(0) is

A. π

B. $-\pi$

C. 0

D. 2π

Answer: A

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21. Derivatives of $y = \cos^{-1}\sqrt{\frac{\cos 3x}{\cos^3 x}}$ with respect to x , is

A. $\sqrt{\frac{6}{\cos 4x + \cos 2x}}$

B. $\frac{6}{\sqrt{\cos 4x + \cos 2x}}$

C. $\frac{\sqrt{6}}{\sqrt{\cos 4x + \cos 2x}}$

D. None of these

Answer: A

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22. if $\sqrt{x^2+y^2} = ae^{\tan^{-1}\left(\frac{y}{x}\right)}, a > 0, (y(0) > 0)$ then $y(0)$ equals

A. $\frac{20}{a}e^{-\pi/2}$

B. $-\frac{20}{a}e^{\pi/2}$

C. $-\frac{2}{a}e^{-\pi/2}$

D. None of these

Answer: C

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23. If y = In $\left(\frac{x}{a+bx}\right)^x$, then $x^3\frac{d^y}{dx^2}$ is equal to

A. $\left(\frac{dy}{dx}+x\right)^2$

B. $\left(\frac{dy}{dx}-y\right)^2$

C. $\left(x\frac{dy}{dx}+y\right)^2$

D. $\left(x\frac{dy}{dx}-y\right)^2$

Answer: D

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24. If $\frac{d^2x}{dy^2}\left(\frac{dy}{dx}\right)^3+\frac{d^2y}{dx^2}=k$, then k is equal to

A. 0

B. 1

C. 2

D. none of these

Answer: A

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25. If $f(x)=|\cos x-\sin x|, \quad \text{then} \quad '\left(\frac{\pi}{6}\right)$ is equal to

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

B. 1

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

D. $\sqrt{3}$

Answer: B

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26. If $f'(x) = \sin(\log x)$ and $y = f\left(\frac{2x+3}{3-2x}\right)$, then $\frac{dy}{dx}$ at $x = 1$ is equal to

A. $6 \sin \log(5)$

B. $5 \sin \log(6)$

C. $12 \sin \log(5)$

D. $5 \sin \log(12)$

Answer: C

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27. If $u = x^2 + y^2$ and $x = s + 3t, y = 2s - t,$ then $\frac{d^2u}{ds^2}$ is equal to

A. 12

B. 32

C. 36

D. 10

Answer: D

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28. If the function f(x) is defined by f(x) = a + bx and

$f^r = fff$ ... (respeated r times) , then $f^r(x)$ is equal to

A. $a + b^r x$

B. $ar + b^r x$

C. $ar + bx^r$

D. $a\left(\frac{b^r - 1}{b - 1}\right) + b^r x$

Answer: D

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29. If $f(x) = x^3 + x^2 \cdot f'(1) + xf''(2) + f''(2) + f'''(3), \forall x \in R$

Where , f(x) is a polynimial of degree 3 , then

A. $f(0) + f(2) = f(1)$

B. $f(0) + f(3) = 0$

C. $f(1) + f(3) = f(2)$

D. All of these

Answer: D

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30. If $x = \tan\frac{y}{2} - \log\left[\frac{\left(1+\tan\frac{y}{2}\right)^2}{\tan\frac{y}{2}}\right]$, then $\frac{dy}{dx}$ is equal to

A. $\frac{1}{2}\sin y(1-\sin y+\cos y)$

B. $\sin y(1-\sin y-\cos y)$

C. $\frac{1}{2}\sin y(1+\sin y+\cos y)$

D. None of the above

Answer: C

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31. If $y = \sec^{-1}\left(\frac{\sqrt{x}+1}{\sqrt{x}-1}\right) + \sin^{-1}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right)$, then $\frac{dy}{dx}$ is equal to?

A. 0

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

C. 1

D. None of these

Answer: A

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32. If $y = \frac{a^{\cos \hat{} ((-1)x)}}{1 + a^{\cos \hat{} ((-1)x)}}$ and $z = a^{\cos \hat{} ((-1)x)}$, then $\frac{dy}{dz}$ is equal to.....

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

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

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

D. None of the above

Answer: C

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33. If $y = \log x . e^{(\tan x + x^2)}$, then $\frac{dy}{dx}$ is equal to

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

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

C. $e^{(\tan x + x^2)}\left[\frac{1}{x} + (\sec^2 x + 2x)\log x\right]$

D. $e^{(\tan x + x^2)}\left[\frac{1}{x} + (\sec^2 x - 2x)\log x\right]$

Answer: C

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34. if $y = \log_{\sin x} \tan x$ then $\left(\frac{dy}{dx}\right)_{\frac{\pi}{4}}$ is

A. $\frac{4}{\log 2}$

B. $-\frac{4}{\log 2}$

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

D. None of these

Answer: B

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35. If $y = \left(\frac{ax+b}{cx+d}\right), \text{then} 2\frac{dy}{dx}.\frac{d^3y}{dx^3}$ is equal to

A. $\left(\frac{d^2y}{dx^2}\right)^2$

B. $3\frac{d^2y}{dx^2}$

C. $3\left(\frac{d^2y}{dx^2}\right)^2$

D. $3\frac{d^2x}{dy^2}$

Answer: C

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36. If $5f(x) + 3f\left(\frac{1}{x}\right) = x + 2$ and $y = xf(x)$, then find $\frac{dy}{dx}$ at $x = 1$.

A. 14

B. $7/8$

C. 1

D. None of these

Answer: B

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37. If y is a function of x and $\log(x+y)-2xy=0$ then the value of $y(0)$ is equal to (a) 1 (b) -1 (c) 2 (d) 0

A. 1

B. -1

C. 2

D. 0

Answer: A

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38. If $y = f(x^2 + 2)$ and $f'(3) = 5$, then $\frac{dy}{dx}$ at x $= 1$ is

A. 15

B. 5

C. 10

D. 25

Answer: C

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39. If $y = \log\left(\frac{1 - x^2}{1 + x^2}\right)$, then $\frac{dy}{dx}$ is equal to

A. $\frac{4x^3}{1 - x^4}$

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

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

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

Answer: B

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

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

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

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

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

Answer: B

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41. If $y = (\cos x)^{(\cos x)^{(\cos x)^{\ldots\infty}}}$, then $\frac{dy}{dx}$ is equal to

A. $\frac{y\tan x}{y\log\cos x - 1}$

B. $\frac{y^2\tan x}{y\log\cos x - 1}$

C. $\frac{y\tan x}{1 + y\log\cos x}$

D. None of these

Answer: B

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42. If $\cos\left(\frac{x}{2}\right)\cos\left(\frac{x}{2^2}\right)\cos\left(\frac{x}{2^{\square}}\right)\ldots\ldots\cos\left(\frac{x}{2^n}\right) = \frac{\sin x}{\sin\left(\frac{x}{2^n}\right)}$ prove that

$$\frac{1}{2}\tan\left(\frac{x}{2}\right) + \frac{1}{4}\tan\left(\frac{x}{4}\right)\ldots\ldots\frac{.1}{2^{2n}}\tan\left(\frac{x}{2^n}\right) = \frac{1}{2^n}\cot\left(\frac{x}{2^n}\right) - \cot x$$

A. $\frac{f'(x)}{f(x)}$

B. $\frac{f(x)}{f'(x)}$

C. $\frac{-f'(x)}{f(x)}$

D. 0

Answer: C

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43. If $x = \log(1 + t^2)$ and $y = t - \tan^{-1} t$, then $\frac{dy}{dx}$ is equal to

A. $e^x - 1$

B. $t^2 - 1$

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

D. $e^x - y$

Answer: C

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44. If the function y(x) reprsented by x = sin t ,

$y = ae^{t\sqrt{2}} + be^{t\sqrt{2}}, t \in \left(-\frac{\pi}{2}, \frac{\pi}{2} \right)$ satisfiles the equation

$(1 - x^2)y'' - xy' = ky$, then k is equal to

A. 1

B. -2

C. 2

D. None of these

Answer: C

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45. If $y = \sqrt{(a-x)(x-b)} - (a-b)\tan^{-1}\left(\frac{\sqrt{a-x}}{\sqrt{x-b}}\right)$ then $\frac{dy}{dx} =$

A. $\sqrt{(a-x)(x-b)}$

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

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

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

Answer: C

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46. If $x = \sec\theta - \cos\theta, y = \sec^{10}\theta - \cos^{10}\theta$ and $(x^2+4)\left(\frac{dy}{dx}\right)^2 = k(y^2+4)$. Then k is equal to

A. $\frac{1}{100}$

B. 1

C. 10

D. 100

Answer: D

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47. If $f(x) = \cot^{-1}\left(\frac{x^x - x^{-x}}{2}\right)$ then f'(1) equals

A. -1

B. 1

C. $\log 2$

D. $-\log 2$

Answer: A

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48. If $x^y = e^{2(x-y)}$, then $f'(x)$ is equal to

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

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

C. $\frac{2\log x}{\log x + 2}$

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

Answer: A

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49. If $\sqrt{1-x^{2n}}+\sqrt{1-y^{2n}}=a^n(x^n-y^n)$, prove that $y^{n-1}\cdot\sqrt{1-x^{2n}}dy=x^{n-1}\sqrt{1-y^{2n}}dx$.

A. $\frac{x^{n-1}}{y^{n-1}}$

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

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

D. 1

Answer: A

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50. If $f(x)=\sin^{-1}(\sin x)+\cos^{-1}(\sin x)$ and $\phi(x)=f(f(f(x)))$, then $\phi'(x)$ is equal to

A. 1

B. $\sin x$

C. 0

D. None of these

Answer: C

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51. Let $x^{\cos y} + y^{\cos x} = 5$, then

A. at $x = 0, y = 0, y' = 0$

B. at $x = 0, y = 1, y' = 0$

C. at $x = y = 1, y' = -1$

D. at $x = 1, y = 0, y' = 1$

Answer: C

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52. If $y = \sin x^{\circ}$ and $u = \cos x$ then $\frac{dy}{dx}$ is equal to

A. $-\operatorname{cosec} x \cdot \cos x$

B. $\frac{\pi}{180} \operatorname{cosec} x^{\circ} \cos x$

C. $-\frac{\pi}{180} \operatorname{cosec} x^{\circ} \cos x$

D. None of these

Answer: C

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53. If $y=\frac{\tan^{-1} 1}{1+x+x^2}+\frac{\tan^{-1} 1}{x^2+3x+3}+\frac{\tan^{-1} 1}{x^2+5x+7}++$ upto n terms, then find the value of $y'(0)$.

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

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

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

D. Nonw of these

Answer: B

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54. If $y = \tan^{-1}\left(\frac{\sin x + \cos x}{\cos x - \sin x}\right)$, then $\frac{dy}{dx}$ is equal to $\frac{1}{2}$ (b) 0 (c) 1 (d) none of these

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

B. 0

C. 1

D. None of these

Answer: C

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55. If $y = \cos^{-1}\left(\frac{2\cos x - 3\sin x}{\sqrt{13}}\right)$, then $\frac{dy}{dx}$ is equal to

A. 1

B. 0

C. constant $(\neq 1)$

D. None of these

Answer: A

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56. Let $y = \frac{x^8 + x^4 + 1}{x^4 + x^2 + 1}$. If $\frac{dy}{dx} = ax^3 + bx$. Then,

A. $a = 4, b = 2$

B. $a = 4, b = -2$

C. $a = -2, b = 4$

D. None of the above

Answer: B

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57. If $y = \sin^{-1}\left\{\frac{5x + 12\sqrt{1 - x^2}}{13}\right\}$, find $\frac{dy}{dx}$.

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

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

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

D. None of these

Answer: A

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58. If $y = \sqrt{x + \sqrt{y + \sqrt{x + \sqrt{y + \ldots\infty}}}}$, then $\frac{dy}{dx}$ is equal to

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

B. $\frac{y^3 + x}{2y^2 - 2xy - 1}$

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

D. None of these

Answer: D

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59. if $y = \sin^{-1}[\sqrt{x - ax} - \sqrt{a - ax}]$ then prove that $\frac{1}{2\sqrt{x}\sqrt{1-x}}$

A. $\frac{1}{\sin\sqrt{a - ax}}$

B. $\sin\sqrt{x} \cdot \sin\sqrt{x}$

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

D. zero

Answer: C

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60. If $y = \log_{x^2+4}(7x^2 - 5x + 1)$, then $\frac{dy}{dx}$ is equal to

A. $\log_e(x^2 + 4).\left\{\frac{14x - 5}{7x^2 - 5x + 1} - \frac{2xy}{x^2 + 4}\right\}$

B. $\frac{1}{\log_e(x^2+4)}\left\{\frac{14x-5}{7x^2-5x+1}-\frac{2xy}{x^2+4}\right\}$

C. $\log_e(7x^2+5x+1)\left\{\frac{2x}{x^2+4}-\frac{(14x-5)y}{7x^2+5x+1}\right\}$

D. $\frac{1}{\log_e(7x^2+5x+1)}\left\{\frac{2x}{x^2+4}-\frac{(14x-5)y}{7x^2+5x+1}\right\}$

Answer: B

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61. If $x=\sec\theta-\cos\theta$ and $y=\sec^n\theta-\cos^n\theta$ then show that $(x^2+4)\left(\frac{dy}{dx}\right)^2=n^2(y^2+4)$

A. $n^2(y^2-4)$

B. $n^2(4-y^2)$

C. $n^2(y^2+4)$

D. None of these

Answer: C

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62. If $x^2 + y^2 = a^2$, then a is equal to

A. $\frac{\sqrt{(1+y'^2)^3}}{|y''|}$

B. $\frac{|y''|}{\sqrt{(1+y'^2)^3}}$

C. $\frac{\sqrt{(1+y'^2)^3}}{2|y''|}$

D. None of these

Answer: A

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63. Let $f(x)$ be a polynomial.Then, the second order derivative of $f(e^x)$ is

$f^{e^x}e^{2x} + f'(e^x)e^x\ f^{e^x}e^x + f'(e^x)\ f^{e^x}e^{2x} + f^{e^x}e^x$ (d) f^{e^x}

A. $f''(e)^x \cdot e^x + f'(e)^x$

B. $f''(e)^x \cdot e^{2x} + f'(e)^x \cdot e^{2x}$

C. $f''(e)^x \cdot e^{2x}$

D. $f''(e)^x \cdot e^{2x} + f'\left((e)^x\right) \cdot e^x$

Answer: D

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64. If $y = \sin^n x \cos nx, \quad \text{then} \frac{dy}{dx}$ is

A. $n \sin^{n-1} x \sin(n+1)x$

B. $n \sin^{n-1} x \cos(n-1)x$

C. $n \sin^{n-1} x \cos nx$

D. $n \sin^{n-1} x \cos(n+1)x$

Answer: D

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65. If $y = \sec^{-1}[\text{cosec x}] + \text{cosec}^{-1}[\sec x] + \sin^{-1}[\cos x] + \cos^{-1}[\sin x]$, then $\frac{d}{d}$ is equal to

A. 0

B. 2

C. -2

D. -4

Answer: D

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66. If $f(x) = \frac{g(x) + g(-x)}{2} + \frac{2}{[h(x) + h(-x)]^{-1}}$, where g and h are differentiable functions, then $f'(0)$

A. 1

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

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

D. 0

Answer: D

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67. If $y = e^x \cdot e^{x^2} \cdot e^{x^3} \cdot \ldots \cdot e^{x^n} \ldots,$ for $- < x < 1,$ then $\frac{dy}{dx}$ at $x = \frac{1}{2}$ is

A. e

B. 4e

C. 2e

D. 3e

Answer: B

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68. If $8f(x) + 6f\left(\frac{1}{x}\right) = x + 5$ and $y = x^2(f(x),$ then $\frac{dy}{dx}$ at $x = -1$ is equal to 0 (b) $\frac{1}{14}$ (c) $-\frac{1}{4}$ (d) None of these

A. 0

B. $\frac{1}{14}$

C. $-\frac{1}{14}$

D. 1

Answer: C

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69. If $f(x) = \frac{x-1}{4} + \frac{(x-1)^2}{12} + \frac{(x-1)^5}{20} + \frac{(x-1)^7}{28} + \ldots$

where $0 < x < 2$, then f'(x) is equal to

A. $\frac{1}{4x(2-x)}$

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

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

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

Answer: A

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70. If $x = e^t \sin t, y = e^t \cos t$ then $\frac{d^2y}{dx^2}$ at $x = \pi$ is

A. $2e^{\pi}$

B. $\frac{1}{2}e^{\pi}$

C. $\frac{1}{2e^{\pi}}$

D. $\frac{2}{e^{\pi}}$

Answer: D

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71. $\frac{d^2x}{dy^2}$ equals

A. $\left(\frac{d^2y}{dx^2}\right)^{-1}$

B. $\left(\frac{d^2y}{dx^2}\right)^{-1}\left(\frac{dy}{dx}\right)^{-3}$

C. $\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-2}$

D. $-\left(\frac{d^2y}{dx^2}\right)\left(\frac{dy}{dx}\right)^{-3}$

Answer: D

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72. If x=sint and y=cos pt, then

A. $(1-x^2)y_2 + xy_1p^2y = 0$

B. $(1-x^2)y_2 + xy_1 - p^2y = 0$

C. $(1+x^2)y_2 + xy_1 - p^2y = 0$

D. $(1-x^2)y_2 - xy_1 + p^2y = 0$

Answer: D

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73. If $a = A\cos 4t + B\sin 4t,$ then $\frac{d^2x}{dt^2}$ is equal to

A. $-16x$

B. $16x$

C. x

D. $-x$

Answer: A

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74. let $y = t^{10} + 1,$ and $x = t^8 + 1,$ then $\frac{d^2y}{dx^2}$ is

A. $\frac{5}{2}t$

B. $20t^8$

C. $\frac{5}{16t^6}$

D. None of these

Answer: B

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75. If $y = \frac{1}{4}u^4, u = \frac{2}{3}x^3 + 5$, then $\frac{dy}{dx} =$

A. $\frac{1}{27}x^2\left(2x^3 + 15\right)^3$

B. $\frac{2}{27}x\left(2x^3 + 5\right)^3$

C. $\frac{2}{27}x^2\left(2x^3 + 15\right)^3$

D. None of these

Answer: B

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76. If $f(1) = 3$, $f'(1) = 2$, then $\frac{d}{dx}\{\log f(e^x + 2x)\}$ at $x = 0$ is equal to.....

A. $2/3$

B. $3/2$

C. 2

D. 0

Answer: A

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77. If $y = \sqrt{\frac{(x-a)(x-b)}{(x-c)(x-d)}}$, then $\frac{dy}{dx}$ is equal to

A. $\frac{y}{2} = \left[\frac{1}{x-a} + \frac{1}{x-b} - \frac{1}{x-c} - \frac{1}{x-d}\right]$

B. $y = \left[\frac{1}{x-a} + \frac{1}{x-b} - \frac{1}{x-c} - \frac{1}{x-d}\right]$

C. $\frac{1}{2} = \left[\frac{1}{x-a} + \frac{1}{x-b} - \frac{1}{x-c} - \frac{1}{x-d}\right]$

D. None of above

Answer: A

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78. Find the derivative of $f(\tan x)$ w.r.t. $g(\sec x)$ at $x = \frac{\pi}{4}$, where $f'(1) = 2$ and $g'\left(\sqrt{2}\right) = 4$.

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

B. $\sqrt{2}$

C. 1

D. 0

Answer: A

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79. If $y^2 = p(x)$, a polynomial of degree 3, then $2\frac{d}{dx}\left(y^3\frac{d^2y}{dx^2}\right)$ equals :

A. $p'''(x) + p'(x)$

B. $P''(x).\,P'''(x)$

C. $P(x)P'''(x)$

D. a constant

Answer: B

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80. Find $\frac{dy}{dx}$, when $x = e^{\theta}\left(\theta + \frac{1}{\theta}\right)$ and $y = e^{-\theta}\left(\theta - \frac{1}{\theta}\right)$

A. $e^{2\theta}\left(\frac{-\theta^3 + \theta^2 + \theta + 1}{\theta^3 + \theta^2 + \theta - 1}\right)$

B. $e^{-2\theta}\left(\frac{-\theta^3 + \theta^2 + \theta + 1}{\theta^3 + \theta^2 + \theta - 1}\right)$

C. $e^{-2\theta}\left(\frac{-\theta^3 + \theta^2 + \theta + 1}{-\theta^3 + \theta^2 + \theta - 1}\right)$

D. None of the above

Answer: A

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Mht Cet Corer

1. Derivative of $\log(\sec\theta + \tan\theta)$ with respect to $\sec\theta$ at $\theta = \frac{\pi}{4}$ is

A. 0

B. 1

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

D. $\sqrt{2}$

Answer: B

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2. If $y = e^{m\sin^{-1}x}$ and $(1-x^2)\left(\frac{dy}{dx}\right)^2 = Ay^2$, then A is equal to

A. m

B. $-m$

C. m^2

D. $-m^2$

Answer: C

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3. If $\log_{10}\left(\frac{x^2-y^2}{x^2+y^2}\right)=2, \quad \text{then}\frac{dy}{dx}$ is equal to

A. $-\frac{99x}{101y}$

B. $\frac{99x}{101y}$

C. $-\frac{99y}{101x}$

D. $\frac{99y}{101x}$

Answer: A

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4. Derivative of $\tan^{-1}\left(\frac{x}{\sqrt{1-x^2}}\right)$ with respect to $\sin^{-1}\left(3x-4x^3\right)$ is

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

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

C. 3

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

Answer: D

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5. If $\tan x = \frac{2t}{1-t^2}$ and $\sin y = \frac{2t}{1+t^2}$, then the value of $\frac{dy}{dx}$ is

A. 1

B. t

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

D. $\frac{1}{1+t}$

Answer: A

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6. If $x^p + y^q = (x+y)^{p+q}$, then $\frac{dy}{dx}$ is

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

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

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

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

Answer: D

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7. At the point x = 1 , then function

$$f(x) = \begin{cases} x^3 - 1 & 1 < x < \infty \\ x - 1 & -\infty < x \leq 1 \end{cases}$$ is

A. continuous and differentiable

B. continuous and not differnetiable

C. discontinuous and differentiable

D. discontinuous and not differntiable

Answer: B

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8. If $x^p y^q = (x + y)^{(p+q)}$ then $\frac{dy}{dx} = ?$

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

B. $\frac{py}{qx}$

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

D. $\frac{qy}{px}$

Answer: A

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9. If $x = 2\cos t - \cos 2t$, $y = 2\sin t - \sin 2t$, then the value of $\left|\frac{d^2y}{dx^2}\right|_{t=\pi/2}$ is

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

B. $-\frac{5}{2}$

C. $\frac{5}{2}$

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

Answer: D

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10. $y = \log\tan\left(\frac{x}{2}\right) + \sin^{-1}(\cos x)$, then $\frac{dy}{dx}$ is

A. cosec x - 1

B. cosec x

C. cosec x + 1

D. x

Answer: A

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11. If $x^2y^5 = (x+y)^7, \quad \text{then} \quad \frac{d^2y}{dx^2}$ is equal to

A. y/x^2

B. x/y

C. 1

D. 0

Answer: D

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12. The equation of tangent to the curve given by

$x = 3\cos\theta, y = 3\sin\theta, at\theta = \frac{\pi}{4}$ is

A. $x + y = \sqrt{2}$

B. $3x + y = 3\sqrt{2}$

C. $x + y = 3\sqrt{2}$

D. $x + 3y = 3\sqrt{2}$

Answer: C

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13. Differentiate $(\log x)^x$ with respect to $\log x$.

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

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

C. $x(\log x)^x\left[\frac{1}{\log x} + \log(\log x)\right]$

D. None of the above

Answer: C

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14. If $x \sec\theta, y = \tan\theta$, then the value of $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{4}$ is

A. 0

B. 1

C. -1

D. 2

Answer: C

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15. If $x = f(t)$ and $y = g(t)$, then write the value of $\frac{d^2y}{dx^2}$.

A. $\frac{f'(t)g''(t) - g'(t)f''(t)}{\{f'(t)\}^3}$

B. $\frac{f'(t)g''(t) - g'(t)f''(t)}{\{f'(t)\}^2}$

C. $\frac{f'(t)g''(t) - g''(t)f''(t)}{\{f'(t)\}^2}$

D. $\frac{f'(t)g''(t) - g''(t)f''(t)}{\{f'(t)\}^3}$

Answer: A

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16. Find $\frac{dy}{dx}$, if x $= 2\cos\theta - \cos 2\theta$ and y = 2sin theta - sin 2 theta `.

A. $\tan\frac{3\theta}{2}$

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

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

D. $-\cot\frac{3\theta}{2}$

Answer: A

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17. find the derivative of $e^x + e^y = e^{x+y}$

A. e^{x-y}

B. e^{x-y}

C. $-e^{y-x}$

D. e^{y-x}

Answer: C

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18. If $xy = \tan^{-1}(xy) + \cot^{-1}(xy), \quad \text{then} \frac{dy}{dx}$ is equal to

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

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

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

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

Answer: B

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19. The derivative of $\cos^3 x$ w.r.t. $\sin^3 x$ is

A. $-\cot x$

B. cot x

C. tan x

D. $-\tan x$

Answer: A

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20. The derivative of log|x| is

A. $\frac{1}{x}, x > 0$

B. $\frac{1}{|x|0, x \neq 0}$

C. $\frac{1}{x}, x \neq 0$

D. None of these

Answer: C

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21. The function $f(x) = e^{-|x|}$ is

A. continous everywhere but not differentiable at x = 0

B. continous and differentiable everywhere

C. continuous at x = 0

D. None of the above

Answer: A

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22. If $f(x) = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ then $f(x)$ is differentiable on

A. $[-1, 1]$

B. $R - \{-1, 1\}$

C. $R - (-1, 1)$

D. None of these

Answer: B

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23. If $y = \log_{\cos x} \sin x$ then $\frac{dy}{dx}$ is equal to

A. $\frac{(\cot x \log\cos x + \tan x \log\sin x)}{(\log\cos x)^2}$

B. $\frac{(\tan x \log\cos x + \cot x \log\sin x)}{(\log\cos x)^2}$

C. $\frac{(\cot x \log\cos x + \tan x \log\sin x)}{(\log\sin x)^2}$

D. None of the above

Answer: A

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24. If $y^2 = ax^2 + bx + c$, where a,b,c, are constants , then $y^3 \frac{d^2y}{dx^2}$ is equal to

A. a constant

B. a function of x

C. a function of x

D. a function of x and y both

Answer: A

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25. If $x = \phi(t), y = \Psi(t), \quad \text{then} \quad \frac{d^2y}{dx^2}$ is equal to

A. $\frac{\phi'\Psi'' - \Psi'\phi''}{(\phi')^2}$

B. $\frac{\phi'\Psi'' - \Psi'\phi''}{(\phi')^3}$

C. $\frac{\phi''}{\Psi''}$

D. $\frac{\Psi''}{\phi''}$

Answer: B

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26. If $y = 5^x x^5, \quad \text{then} \frac{dy}{dx}$ is

A. $5^x\left(x^5 \log 5 - 5x^4\right)$

B. $5^x \log 5 - 5x^4$

C. $5^x \log 5 + 5x^4$

D. $5^x\left(x^5 \log 5 + 5x^4\right)$

Answer: D

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27. If $y = \tan^{-1}\left(\frac{a\cos x - b\sin x}{b\cos x + a\sin x}\right)$ then $\frac{dy}{dx} = ?$

A. 2

B. -1

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

D. 0

Answer: B

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28. $\frac{d}{dx}\left[\sec\left\{\cos^{-1}\left(\frac{x}{8}\right)\right\}\right]$ is equal to

A. $\frac{1}{8}$

B. $-\frac{1}{8}$

C. $\frac{8}{x^2}$

D. $-\frac{8}{x^2}$

Answer: D

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29. If $f(x)=\sqrt{1+\cos^2\left(x^2\right)}, then f'\left(\frac{\sqrt{\pi}}{2}\right)$ is $\frac{\sqrt{\pi}}{6}$ (b) $-\sqrt{\pi/6}\ 1/\sqrt{6}$ (d) $\pi/\sqrt{6}$

A. $\frac{\sqrt{\pi}}{6}$

B. $-\sqrt{\frac{\pi}{6}}$

C. $\frac{1}{\sqrt{6}}$

D. $\frac{\pi}{\sqrt{6}}$

Answer: B

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30. If $y = a\sin^3\theta$ and $x = a\cos^3\theta$. then at $\theta = \frac{\pi}{3}$, $\frac{dy}{dx}$ is equal to

A. $\frac{1}{\sqrt{3}}$

B. $-\sqrt{3}$

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

D. $\sqrt{3}$

Answer: B

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31. If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \ldots \infty}}}$, then $\frac{dy}{dx}$ is equal to

A. sin x

B. $-\cos x$

C. cos x

D. $-\sin x$

Answer: C

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32. The nth derivatiive of $(x+1)^n$ is

A. $(n-1)!$

B. $(n+1)!$

C. $n!$

D. $n[(n+1)]^{n-1}$

Answer: C

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33. If $y = a\sin(5x+c)$, then

A. $\frac{dy}{dx} = 5y$

B. $\frac{dy}{dx} = -5y$

C. $\frac{d^2y}{dx^2} = -25y$

D. $\frac{d^2y}{dx^2} = 25y$

Answer: C

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34. If $\sin(xy) + \frac{x}{y} = x^2 - y$, then $\frac{dy}{dx}$ is equal to

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

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

C. $\frac{(2xy - y^2\cos xy - 1)xy}{xy^2\cos xy - x + y^2}$

D. $\frac{(2x^2 - y^2\cos xy - 1)x}{xy^2\cos xy - x + y^2}$

Answer: B

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35. If $y = x^{\tan x} + \sqrt{\frac{x^2+1}{2}}, f \in d\frac{dy}{dx}$

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

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

C. $x^{\tan x}\left[\frac{\tan x}{x} + \log x . \sec^2 x\right] + \frac{x}{\sqrt{2(x^2+1)}}$

D. None of the above

Answer: C

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