MATHS

BOOKS - MODERN PUBLICATION MATHS (KANNADA ENGLISH)

DIFFERENTIABILITY AND DIFFERENTIATION

Mcqs Level I

1. For a real number x, let [x] denote the greatest integer less than or equal to x. Then $f(x) = \frac{\tan(\pi[x-\pi])}{1+[x]^2}$ is :

A. continuous at some x

B. continuous at all x but $f'(x)$ does not exist

C. $f'(x)$ exists for all x, but $f''(x)$ does not exist

D. $f'(x)$ exists all x.

Answer: D

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2. Let $f(x) = \frac{\sin 4\pi[x]}{1+[x]^2}$, where $[x]$ is the greatest integer $\leq x$, then :

A. $f(x)$ is not differentiable at some points

B. $f'(x)$ exists but is different from 0

C. $f'(x) = 0$ for all x

D. $f'(x) = 0$ but f is not a constant function.

Answer: C

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3. Let $f(x) = x\left(x - \sqrt{x+1}\right)$. Then :

A. $f(x)$ is continuous but not differentiable at $x = 0$

B. $f(x)$ is differentiable at $x = 0$

C. $f(x)$ is not differentiable at $x = 0$

D. None of these.

Answer: B

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4. If $f(x) = x|x|,\ \forall x \in R.$ then :

A. f is derivable at $x = 0$ and $f'(0) = 1$

B. f is disconitinuous at $x = 0$

C. f is derivable at $x = 0$ but $f'(0) \neq 0$

D. None of these.

Answer: D

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5. Every continuous function is :

A. differentiable

B. increasing

C. decreasing

D. not differentiable

Answer: D

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6. If $y = \begin{cases} x, x > 0 \\ 0, x = 0, \\ -x, x < 0 \end{cases}$ then at $x = 0$, y is

A. not continuous

B. continuous but not differentiable

C. differentiable

D. None of these.

Answer: B

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7. If $f(x)$ is a polynomial of degree $m(\geq 1)$, then which of the following is not true ?

A. $\frac{d^n y}{dx^n} = 0$, for all $n > m$

B. f is derivable at all $x \in R$

C. f is continuous at all $x \in R$

D. None of these.

Answer: D

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8. If $f(x) = \text{sgn}\ \ x^3$ for all x, then :

A. $Lf'(0) = -3$

B. $Rf'(0) = 3$

C. f is derivable at $x = 0$

D. f is continuous but not derivable at $x = 0$.

Answer: C

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9. The area bounded by the curve $y = \begin{cases} x^2, x < 0 \\ x, x \geq 0 \end{cases}$ and the line $y = 4$ is

A. $f(x)$ is not derivable at $x = 0$

B. $f(x)$ is derivable at $x = 0$

C. $f(x)$ is not continuous at $x = 0$

D. $f(x)$ is continuous but not derivable at $x = 0$.

Answer: B

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10. The function $d(x) = (x - a)^2 \cos \frac{1}{x - a}$ for $x \neq a$ and $f(a) = 0$ is :

A. derivable at $x = a$

B. not continuous at $x = a$

C. continuous but not derivable at $x = a$

D. None of these.

Answer: A

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11. The function $f(x) = 1 + |\sin x|$ is :

A. differentiable everywhere

B. differentiable nowhere

C. continuous everywhere

D. continuous nowhere.

Answer: C

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12. The function $f(x) = (x - a)\sin\frac{1}{x - a}$ for $x \neq a$ and $f(a) = 0$ is :

A. derivable at $x = a$

B. not continuous at $x = a$

C. continuous but not derivable at $x = a$

D. None of these.

Answer: C

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13. Let $f(x) = [x]$, then $f(x)$ is :

A. differentiable for all $x \in (R - I)$

B. differentiable for all $x \in R$

C. continuous for all $x \in R$

D. continuous nowhere.

Answer: A

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14. $f(x) = 1, x \leq -1$

$= |x|, -1 < x < 1$

$= 0, x \leq 1$. Then :

A. f is continuous at $x = -1$

B. f is differentiable for all x

C. f is continuou everywhere

D. f is differentiable at $x = -1$.

Answer: A

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15. If $y = x$ for $x > 0, y = 0$, for $x = 0, y = -x, x < 0$, then at $x = 0$, y is :

A. not continuous

B. differentiable

C. continuous but not differentiable

D. None of these.

Answer: C

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16. If $\lim_{x \to a} \frac{a^x - x^a}{x^x - a^a} = -$, then :

A. $a = 1$

B. $a = 0$

C. $a = e$

D. None of these.

Answer: A

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17. At the point $x = 1$, the function :

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

A. discontinuous and not differentiable

B. continuous and differentiable

C. continuous and not differentiable

D. discontinuous and differentiable.

Answer: C

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18. $g(x) = xf(x),$ where $f(x) = x\sin\frac{1}{x}, x \neq 0 = 0, x = 0.$ At $x = 0$:

A. g is differentiable but g' is continuous

B. g is differentiable but g' is not continuous

C. g is differentiable while f is not continuous

D. both f and g are differentiable.

Answer: A

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19. Let $f(x) = 0$ if $x < 0$, $f(x) = x^2$ if $x \geq 0$, then for all x:

A. f is continuous

B. f is differentiable for all x

C. f is not dofferentiable

D. f is not continuous.

Answer: A

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20. If

$f(x) = 3x^2 + 12x - 1, \ -1 \leq x \leq 2, \ = 37 - x, 2 < x \leq 3$

, then :

A. $f'(x)$ exists for all x

B. $f'(x)$ is discontinuous on $[-1, 3]$

C. $f(x)$ is continuous on $[-1, 3]$

D. $f'(2)$ does exist.

Answer: C

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21. The derivative of an even function is :

A. an even function

B. an odd function

C. non-negative

D. None of these.

Answer: B

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22. The derivative of an odd function is :

A. an even function

B. an odd function

C. negative

D. None of these.

Answer: A

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23. If $f(x)$ be any function, which assumes only positive value and $f'(x)$ exists, then $f'(x)$ is

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

B. $f(x)\frac{d}{dx}(\log f(x))$

C. $f(x)\frac{d}{dx}e^{f(x)}$

D. None of these

Answer: B

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24. Let f and g be differentiable functions such that $(\text{fog})' = I$. If $g'(a) = 2$ and $g(a) = b$, then $f'(b)$ equals :

A. -2

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

C. 2

D. None of these

Answer: B

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25. If $f(x) = x^2 g(x)$ and $g(x)$ is twice differentiable, then $f''(x)$ is :

A. $x^2 g''(x) + 4x g''(x) + 2g(x)$

B. $x^2 g''(x) + 2x g'(x) + 2g(x)$

C. $2g''(x)$

D. None of these

Answer: A

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26. If the function f is defined by $f(x) = \frac{x}{1+|x|}$, then at what points is f differntiable ?

A. everywhere

B. except at $x = \pm 1$

C. except at $x = 0$

D. except at $x = 0$ or ± 1.

Answer: A

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27. If $f(x) = x \sin x$, $f'\left(\frac{\pi}{2}\right)$ is equal to :

A. 0

B. 1

C. -1

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

Answer: B

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28. If $y = \frac{\sin x + \cos x}{\sin x - \cos x}$, then $\frac{dy}{dx}$ at $x = 0$ is :

A. -2

B. 0

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

D. Does not exist.

Answer: A

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29. If $y = \frac{\sin(x + 9)}{\cos x}$, then $\frac{dy}{dx}$ at $x = 0$ is :

A. $\cos 9$

B. $\sin 9$

C. 0

D. 1

Answer: A

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30. If $f(x) = 1 + x + \frac{x^2}{2} + \ldots + \frac{x^{100}}{100}$, then $f'(a)$ is equal to :

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

B. 100

C. Does not exist

D. 0

Answer: B

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31. If $f(x) = \frac{x^n - a^n}{x - a}$ for some constant 'a', then $f'(a)$ is

:

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

B. 100

C. Does not exist

D. 0

Answer: C

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32. Differential coefficient of $\sec\left(\tan^{-1} x\right)$ w.r.t x is

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

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

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

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

Answer: A

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33. If $u = \sin^{-1}\left(\dfrac{2x}{1+x^2}\right)$ and $v = \tan^{-1}\left(\dfrac{2x}{1-x^2}\right)$, then $\dfrac{du}{dv}$ is :

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

B. x

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

D. 1

Answer: D

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34. If $y = \sqrt{\sin x + y}$, 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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35. The derivative of $\cos^{-1}\left(2x^2-1\right)$ w.r.t. $\cos^{-1}$ is

A. 2

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

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

D. $1-x^2$.

Answer: A

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36. If $x = t^2 y = t^3, then \frac{d^{2y}}{dx^2} = \frac{3}{2}$ (b) $\frac{3}{(4t)}$ (c) $\frac{3}{2(t)}$ (d) $\frac{3t}{2}$

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

B. $\frac{3}{4}t$

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

D. 3

Answer: B

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37. If $f(x) = e^x g(x), g(0) = 2, g'(0) = 1, then f'(0)$ is

A. 1

B. 3

C. 2

D. 0

Answer: B

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38. If $f(x+y)=f(x)\times f(y)$ for all $x, y \in R$ and $f(5)=2, f'(0)=3, then f'(5)=$

A. 5

B. 6

C. 0

D. None of these

Answer: B

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

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

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

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

D. None of these.

Answer: C

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

A. 1

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

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

D. 0

Answer: D

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41. The value of $\lim_{x \to 0} (\cos x + a \sin bx)^{\frac{1}{x}}$ is :

A. 1

B. ab

C. e^{ab}

D. $e^{b/a}$.

Answer: C

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42. $\lim_{h \to 0} \frac{\cos^2(x+h) - \cos^2 x}{h}$ is equal to :

A. $\cos^2 x$

B. $-\sin 2x$

C. $\sin x \cos x$

D. $2 \sin x$.

Answer: B

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43. Differential coefficient of $\sin^{-1} x$ w.r.t. $\cos^{-1} \sqrt{1-x^2}$ is equal to.....

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

B. 1

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

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

Answer: B

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44. If $2^x + 2^y = 2^{x+y}$ then $\frac{dy}{dx}$ is equal to

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

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

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

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

Answer: C

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45. If $y = f\left(\frac{2x-1}{x^2+1}\right)$ and $f'(x) = \sin x^2$, then dy/dx =

A. $\cos x^2 f'(x)$

B. $-\cos x^2 f'(x)$

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

D. None of these.

Answer: C

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

A. 1

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

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

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

Answer: D

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

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

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

C. $\frac{\cos x}{2y+1}$

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

Answer: D

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48. If $f(x) = \log_{e^2}(\log x)$, then $f'(e)$ is :

A. 0

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

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

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

Answer: B

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49. If $f(x) = \cot^{-1}(\cos 2x)^{1/2}$, then $f'(\pi/6)$ is :

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

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

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

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

Answer: C

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50. $\frac{d}{dx}\left[\text{cosec}^{-1}\left(\frac{1+x^2}{2x}\right)\right]$ is :

A. $-\frac{2}{1+x^2}, x \neq 0$

B. $\frac{2}{1+x^2}, x \neq 0$

C. $\frac{2(1-x^2)}{(1+x^2)|1-x^2|}, \neq \pm 1, 0$

D. None of these.

Answer: B

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51. If $y = \log\left(\sqrt{x} + \sqrt{x-a}\right)$, then $\frac{dy}{dx}$ is :

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

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

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

D. None of these

Answer: B

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52. $\frac{d}{dx}\left(\frac{x}{2}\sqrt{x^2+a^2}+\frac{a^2}{2}\log\left(x+\sqrt{x^2+a^2}\right)\right)$ is

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

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

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

D. None of these .

Answer: B

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53. If $y = \sqrt{\cos x^2 + \sqrt{\cos x^2 + \sqrt{\cos x^2 + \ldots\ldots \quad \text{to}\infty}}}$, then $\frac{dy}{dx}$ is :

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

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

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

D. None of these

Answer: B

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54. If f is derivable at x =a,then $\lim_{x \to a} \left(\frac{xf(a) - af(x)}{x - a} \right)$

A. $f(a) - af'(a)$

B. $af'(a) - f(a)$

C. $f'(a)$

D. None of these

Answer: A

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55. The function f is differentiable with $f(a) = 8, f'(1) = \frac{1}{8}$, If f is invertible and $g = f^{-1}$ then :

A. $g'(8) = \frac{1}{8}$

B. $g'(8) = 8$

C. $g'(1) = \frac{1}{8}$

D. $g(1) = 8.$

Answer: B

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56. If $G(x) = \frac{1}{\sqrt{25 - x^2}}$, then $\lim_{x \to 4} \frac{G(x) - G(4)}{x - 4}$ has the value :

A. $\frac{4}{27}$

B. $-\frac{4}{27}$

C. $-\frac{4}{3\sqrt{3}}$

D. $\frac{4}{9}.$

Answer: A

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57. If $y = \tan^{-1}\left(\frac{4x}{1-5x^2}\right) + \tan^{-1}\left(\frac{3+8x}{8-3x}\right)$, then $\frac{dy}{dx}$ is :

A. $\frac{5}{1+x^2}$

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

C. $\frac{5}{1+(5x)^2}$

D. None of these.

Answer: C

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58. If

$$y = \tan^{-1}\frac{\left(\sqrt{1+\sin x}+\sqrt{1-\sin x}\right)}{\left(\sqrt{1+\sin x}-\sqrt{1-\sin x}\right)}, \quad \text{find} \quad \frac{dy}{dx}.$$

A. $x/2$

B. $-1/2$

C. $1/2$

D. None of these

Answer: C

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59. If $y = \sin^{-1}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right) + \sec^{-1}\left(\frac{\sqrt{x}+1}{\sqrt{x}-1}\right), x > 0,$ then $\frac{dy}{dx}$ is :

A. $\pi/2$

B. 1

C. 0

D. None of these.

Answer: C

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60. If $y = x^{x^{x^{\cdots\cdots\infty}}}$, then $x\frac{dy}{dx}$ equals :

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

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

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

D. None of these

Answer: C

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61. Given $f(x)=4x^8$, then $f'\left(\frac{1}{2}\right)=f'\left(-\frac{1}{2}\right)$ (b) $f\left(\frac{1}{2}\right)=-f'\left(-\frac{1}{2}\right)$ (c) $f\left(-\frac{1}{2}\right)=f\left(-\frac{1}{2}\right)$ (d) $f\left(\frac{1}{2}\right)=f'\left(-\frac{1}{2}\right)$

A. $f'\left(\frac{1}{2}\right)=f'\left(\frac{-1}{2}\right)$

B. $f'(x) = f'\left(\frac{-1}{2}\right)$

C. $f\left(\frac{1}{2}\right) = f'\left(\frac{-1}{2}\right)$

D. $f\left(\frac{-1}{2}\right) = f\left(\frac{1}{2}\right)$

Answer: D

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

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

B. $(\sin x)^{\tan x}\left(1 + \sec^2 x \log \sin x\right)$

C. $\tan x(\sin x)^{\tan x - 1} \cos x$

D. $(\sin x)^{\tan x} \sec^2 x . \log \sin x .$

Answer: B

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63. If $x = a(\theta + \sin\theta), y = a(1 + \sin\theta)$, then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{3}$ is :

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

B. 3

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

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

Answer: A

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64. If $f(x+y)=f(x)f(y)$ and $f(x)=1+\mathrm{xg(x)}\ \mathrm{G(x)}$, where $\lim_{x\to 0} g(x)=a$ and $\lim_{x\to 0} G(x)=b$. Then $f'(x)$ is equal to :

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

B. $1+ab$

C. ab

D. None of these.

Answer: D

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65. Find the derivative of the following functions :

$5\sin x - 6\cos x + 7$

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66. If $x = 2\cos t - \cos 2t, y = 2\sin t - \sin 2t,$ then the value of $\frac{d^2y}{dx^2}$ at $t = \pi/2$ is :

A. $3/2$

B. $-3/2$

C. $5/2$

D. $-5/2.$

Answer: B

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67. If $y = e^{-x}(A\cos x + B\sin x)$, then y satisfies :

A. $\frac{d^2y}{dx^2} + \frac{2dy}{dx} = 0$

B. $\frac{d^2y}{dx} - \frac{2dy}{dx} + 2y = 0$

C. $\frac{d^2y}{dx^2} + \frac{2dy}{dx} + 2y = 0$

D. $\frac{d^2y}{dx^2} + 2y = 0.$

Answer: C

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68. If $y = \log_e x$ and n is a positive integer, then $\frac{d^n y}{dx^n}$ is equal to :

A. $\left(-\frac{e}{x}\right)^n$

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

C. $(n-1)!x^{-n}$

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

Answer: D

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69. If y =sin (sin x) and $\frac{d^2y}{dx^2} + \frac{dy}{dx}$ tan x + f(x) = 0, then find f(x).

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

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

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

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

Answer: D

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70. If $y = \log(\sec x)$, then $\frac{d^2y}{dx^2}$ is :

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

B. $\sec^2 x$

C. $-\text{cosec}\ \ x - x \cot x$

D. $\sec x \tan x$.

Answer: B

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71. If $y = a \sin mx + b \cos mx$, then $\frac{d^2y}{dx^2}$ is

A. $-m^2y$

B. my

C. m^2y

D. None of these.

Answer: A

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72. If $y = ae^{mx} + be^{-mx}$, then y_2 is :

A. $-m^2y$

B. my_1

C. m^2y

D. None of these.

Answer: C

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73. If $y^2 = ax^2 + b, \quad \text{then} \quad \frac{d^2y}{dx^2}$

A. $\frac{ab}{y^3}$

B. $\frac{ab}{x^3}$

C. $\frac{ab}{y^2}$

D. None of these.

Answer: A

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74. $\sqrt{x+y}+\sqrt{y-x}=c, then \frac{d^2y}{dx^2}$ equals

A. $\frac{2}{c^2}$

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

C. $-\frac{2}{c^2}$

D. None of these.

Answer: A

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75. If $y = x + e^x$, then $\frac{d^2x}{dy^2}$ is equal to

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

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

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

D. e^x.

Answer: C

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76. Let f be a twice differentiable function such that $f^x = -f(x), and f'(x) = g(x), h(x) = [f(x)]^2 + [g(x)]^2.$

Find $h(10)$ if $h(5) = 11$

A. 0

B. 22

C. 11

D. None of these.

Answer: C

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77. If $f'(2) = 2, f''(2) = 1$, then $\lim_{x \to 2} \frac{2x^2 - 4f'(x)}{x - 2}$, is

A. 4

B. 0

C. 2

D. ∞.

Answer: A

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78. The function $f(x) = \cos|x| + (x^2 - 1)|x^2 - 3x + 2|$ is not differentiable at :

A. 2

B. 1

C. 0

D. -1

Answer: A

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79. Which of the following function is differentiable at $x = 0$?

A. $\cos(|x|) + |x|$

B. $\cos(|x|) - |x|$

C. $\sin(|x|) + |x|$

D. $\sin(|x|) - |x|$.

Answer: D

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80. Let $f(2) = 4$ and $f'(2) = 4$.

Then $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x - 2}$ is given by :

A. 2

B. -2

C. -4

D. 3

Answer: C

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81. IF $x^y = e^{x-y}$, then $\frac{dy}{dx}$ is

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

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

C. not defined

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

Answer: D

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82. If $y = \left(x + \sqrt{1 + x^2}\right)^n$, then $\left(1 + x^2\right) \frac{d^2y}{dx^2} + x \frac{dy}{dx}$ is

A. $n^2 y$

B. $-n^2 y$

C. $-y$

D. $2x^2 y$.

Answer: A

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83. If $\sin y = x \sin(a + y)$, then $\frac{dy}{dx}$ is :

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

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

C. $\sin a \sin^2(a+y)$

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

Answer: D

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84. Let $f: R \to R$ be such that $f(1)=3$ and $f(1)=6$. Then $\lim_{x \to 0}\left(\frac{f(1+x)}{f(1)}\right)^{1/x}$ equal

A. 1

B. $e^{1/2}$

C. e^2

D. e^3.

Answer: C

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85. If y is a function of x and $\log(x+y)-2xy=0$, then $y'(0)$ is equal to :

A. 1

B. -1

C. 2

D. 0

Answer: A

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Mcqs Level Ii

1. If $f(x) = ax^2 + b, b \neq 0, x \leq 1$

$= bx^2 + ax + c, x > 1,$

then $f(x)$ is continuous and differentiable at $x = 1$ if :

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

B. $a = b$, c arbitrary

C. $a = b, c = 0$

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

Answer: A

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2. $f(x) = |[x]x|,$ in $-1 \leq x \leq 2,$ is :

A. continuous at $x = 2$

B. differentiable at $x = 0$

C. continuous at $x = 0$

D. discontinuous at $x = 0$

Answer: C

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3. At the point $x = 1,$ the 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. continuos and not differntiable

C. discontinuous and differntible

D. discontinuous and not differntiable

Answer: B

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4. If $f(x) = \int_{-1}^{x} |t| dt, x \geq -1$, then :

A. f and f' are continuous for $x + 1 > 0$

B. f is continuous nut f' is not for $x + 1 > 0$

C. f and f' are continuous at $x = 0$

D. f is continuous at $x = 0$ but f' is not so.

Answer: A

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5. Consider $f(x) = \begin{cases} \frac{x^2}{|x|}, x \neq 0 \\ 0, x = 0. \end{cases}$

A. $f(x)$ is discontinuous everywhere

B. $f(x)$ is continuous everywhere

C. $f'(x)$ exists in $(-1, -1)$

D. $f'(x)$ exists in $(-2, 2)$.

Answer: B

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6. There exists a function $f(x)$ satisfying :

$f(0) = 1, f(1) = -\frac{1}{e}, f(x) > 0$ for all x and :

A. $f''(x) > 0$ for all x

B. $-1 < f'(x) < 0$ for all x

C. $-2 \leq f''(x) < -1$ for all x

D. $f''(x) < -2$ for all x.

Answer: C

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7. If $f(a) = 2, f'(a) = 1, g(a) = -, g'(a) = 2$, then the value of $\lim_{x \to a} \frac{g(x)f(a) - g(a)f(x)}{x - a}$ is :

A. -5

B. $\frac{1}{5}$

C. 5

D. None of these.

Answer: C

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8. Let f be function satisfying $f(x+y)=f(x)+f(y)$ and $f(x)=x^2g(x)$, for all x and y, where $g(x)$ is a continuous function. Then $f'(x)$ is :

A. $g'(x)$

B. $g(0)$

C. $g(0) = g'(0)$

D. 0

Answer: B

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9. If $f(x)$ is odd differentiable function defined on $(-\infty, \infty)$, such that $f'(3) = 2$, then $f'(-3)$ is :

A. 0

B. 1

C. 2

D. 4

Answer: C

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10. Let $f(x+y)=f(x)f(y)$ and $f(x)=1+(\sin 2x)g(x)$, where $g(x)$ is continuous. Then $f'(x)$ is equal to :

A. $2g(0)$

B. $f(x)g(0)$

C. $2f(x)g(0)$

D. None of these.

Answer: C

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11. The number of points at which the function :

$$f(x) = |x - 0 \cdot 5| + |x - 1| + \tan x$$

does not have a derivative in the interval $(0, 2)$ is :

A. 1

B. 2

C. 3

D. 4

Answer: C

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12. The derivative of $\tan^{-1}\left[\frac{\sqrt{1+x^2}-1}{x}\right]$ with respect to $\tan^{-1}$ x is

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

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

C. 1

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

Answer: D

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13. If $x = \sec\theta - \cos\theta, y = \sec^n\theta - \cos^n\theta$, then $\left(\frac{dy}{dx}\right)^2$ is :

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

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

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

D. $\left(\frac{ny}{x}\right)^n - 4.$

Answer: A

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14. The derivative of $\sec^{-1}\left(\frac{1}{2x^2-1}\right)$ w.r.t. $\sqrt{1-x^2}$ at $x = \frac{1}{2}$ is

A. 2

B. 4

C. 1

D. -2

Answer: B

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15. The differentiable coefficient of x^6 w.r.t. x^3 is :

A. $6x^5$

B. $3x^2$

C. $2x^3$

D. x^3

Answer: C

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16. If $y = (\sin x)^{\cos x}$, then find $\frac{dy}{dx}$.

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17. The function $f(x) = (x^2 - 1)|x^2 - 3x + 1| + \cos(|x|)$ is not differentiable at :

A. -1

B. 0

C. 1

D. 2

Answer: D

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18. If $y = ce^{x/(x-a)}$, then $\frac{1}{y}\frac{dy}{dx}$ is equal to :

A. $a(x-a)^2$

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

C. $a^2(x-a)^2$

D. None of these.

Answer: B

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19. If $y^2 = P(x)$ is a polynomial of degree 3, then $2\left(\frac{d}{dx}\right)\left(y^2\frac{d^2y}{dx^2}\right)$ is equal to $P^x + P'(x)$ (b) $P^x\dot{P}^x$ $P(x)\dot{P}^x$ (d) a constant

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

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

C. $p(x)p'''(x)$

D. a constant.

Answer: C

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20. If $x = f(t)$ and $y = g(t)$, then $\frac{d^2y}{dx^2}$ is equal to

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

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

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

D. None of these

Answer: B

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21. Derivative of $(\log x)^4$ is

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22. If $x = e^{y+e^{y+\ldots\ldots\text{to }\infty}}$, $x > 0$, then $\frac{dy}{dx}$ is :

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

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

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

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

Answer: C

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

A. 4

B. 3

C. 6

D. 5

Answer: D

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24. If f is a real valued differentiable function satisfying : $|f(x)-f(y)| \leq (x-y)^2, x, y \in R$ and $f(0)=0$, then $f(1)$ equals :

A. 0

B. -1

C. 1

D. 2

Answer: A

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25. If $f(x) = ||x| - 1|$, then it is non - derivable at :

A. 0

B. ± 1

C. $0, \pm 1$

D. 1

Answer: C

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26. If $f: R \to T$ is continuous and differentiable function such that $f\left(\frac{1}{n}\right) = 0$ for $n \in I$ and $b \geq 1$, then :

A. $f'(0) = 0 = f(0)$

B. $f(0) = 0$ but $f'(0)$ need not be zero

C. $f(x) = 0, x \in (0, 1)$

D. None of these

Answer: A

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27. If $x \sin y + y \cos x = \pi$, then the value of $y''(0)$ is :

A. π

B. $-\pi$

C. 1

D. 0

Answer: A

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28. The set of points, where $f(x) = \frac{x}{1+|x|}$ is differentiable, is :

A. $(\infty, 0) \cup (0, \infty)$

B. $(-\infty, -1) \cup (-1, \infty)$

C. $(-\infty, \infty)$

D. $(0, \infty)$

Answer: C

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29. If $x^m y^n = (x+y)^{m+n}$, then $\frac{dy}{dx} =$

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

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

C. xy

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

Answer: A

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30. Let $f(x)$ be differntiable on the interval $(0, \infty)$ such that $f(1) = 1$ and $\lim_{t \to x} \frac{t^2 f(x) - x^2 f(t)}{t - x} = 1$ for each $x > 0$. Then $f(x)$ is :

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

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

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

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

Answer: A

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31. Let $f: R \to R$ be a function defined by :

$f(x) = \text{Min.}\{x+1, |x|+1\}$.

Then which of the following is true ?

A. $f(x)$ is not differentiable at $x = 1$

B. $f(x)$ is differentiable everywhere

C. $f(x)$ is not differentiable at $x = 1$

D. $f(x) \geq 1$ for all $x \in R$.

Answer: B

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32. Let $f(x) = \dfrac{(x-1)^n}{\log\cos^m(x-1)}, 0 < x < 2, m$ and n are intgers, $m \neq 0, n > 0$, and let p be the left hand derivative of $|x-1|$ at $x = 1$. If $\lim_{x \to 1^+} g(x) = p$, then :

A. $n = 1, m = 1$

B. $n = 1, m = -1$

C. $n = 2, m = 2$

D. $n > 2, m = n.$

Answer: C

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33. Let y be an implicit fuction of x defined by :

$x^{2x} - 2x^{x} \cot y - 1 = 0$. Then $f'(1)$ equals :

A. -1

B. 1

C. $\log 2$

D. $-\log 2$.

Answer: A

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34. Let $f(x)\begin{cases} (x-1)\sin\frac{1}{x-1}, & \text{if } x \neq 1 \\ 0, & \text{if } x = 1. \end{cases}$

Then which one of the following is true ?

A. f is differentiable at $x = 1$ but not at $x = 0$

B. f is neither differentiable at $x = 0$ nor at $x = 1$

C. f is differentiable at $x = 0$ but not at $x = 1$

D. f is differentiable at $x = 0$ but not at $x = 1$.

Answer: B

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35. Let $g(x) = \log(f(x))$, where $f(x)$ is a twice differentiable positive function on $(0, \infty)$, such that $f(x+1) = xf(x)$.

Then for $N = 1, 2, 3, \ldots\ldots\ldots\ldots g'\left(N + \frac{1}{2}\right) - g''\left(\frac{1}{2}\right) =$

A. $-4\left\{1+\frac{1}{9}+\frac{1}{25}+\ldots+\frac{1}{(2N-1)^2}\right\}$

B. $4\left\{1+\frac{1}{9}+\frac{1}{25}+\ldots..+\frac{1}{(2N-1)^2}\right\}$

C. $-4\left\{1+\frac{1}{9}+\frac{1}{25}+\ldots..+\frac{1}{(2N+1)^2}\right\}$

D. $4\left\{1+\frac{1}{9}+\frac{1}{25}+\ldots..+\frac{1}{(2N+1)^2}\right\}$.

Answer: A

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Latest Question From Aieee Jee Examinations

1. Let $f:(-1,1)\to R$ be a differentiable function with $f(0)=-1$ and $f'(0)=1$. Let $g(x)=[f(2f(x)+2)]^2$. Then $g'(0)=$

A. 4

B. -4

C. 0

D. -2

Answer: B

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

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

Answer: D

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3. If function $f(x)$ is differentiable at $x = a$, then $\lim_{x \to a} \frac{x^2 f(a) - a^2 f(x)}{x - a}$ is :

A. $a^2 f'(a)$

B. $af(a) - a^2 f'(a)$

C. $2af(a) - a^2 f'(a)$

D. $2af(a) + a^2 f'(a)$.

Answer: C

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4. (B) Let $f(x) = \begin{cases} x^2\left|\cos\frac{\pi}{x}\right|, x \neq 0 \\ 0 \quad , x = 0 \end{cases}$ $x \in R$, then f is :

A. differentiable both at $x = 0$ and at $x = 2$

B. differentiable at $x = 0$ but not differebtible at $x = 2$

C. not - differentiable at $x = 0$ but diffentiable at $x = 2$

D. differentiable at neither at $x = 0$ nor at $x = 2$.

Answer: B

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

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

B. 1

C. $\sqrt{2}$

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

Answer: D

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6. If g is the inverse of a function f and $f'(x)=\frac{1}{1+x^5}$, then $g'(x)$ is equal to :

A. $5x^4$

B. $\frac{1}{1+\{g(x)\}^5}$

C. $1+\{g(x)\}^5$

D. $1+x^5$.

Answer: B

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7. If the function, $g(x)=\begin{cases} k\sqrt{x+1} & , \quad 0 \leq x \leq 3 \\ mx+2 & , \quad 3 < x \leq 5 \end{cases}$ is differentiable, then the value of $k+m$ is :

A. 2

B. $\frac{16}{5}$

C. $\frac{10}{3}$

D. 4

Answer: A

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Rcqs Questions From Karnataka Cet Comed

1. If the three function $f(x), g(x)$ and $h(x)$ are such that $h(x) = f(x)g(x)$ and $f'(a)g'(x) = c$, where c is a constant, then :

$$\frac{f''(x)}{f(x)} + \frac{g''(x)}{g(x)} + \frac{2c}{f(x)f(x)}$$ is equal to :

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

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

C. $\frac{h(x)}{h''(x)}$

D. $h'(x).\, h''(x).$

Answer: B

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2. The drivative of $e^{ax}\cos$ bx with rexpect to x is $re^{ax}\cos bx + \tan^{-1}\frac{b}{a}$. When $a > 0, b > 0$, the value of r is :

A. $a + b$

B. ab

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

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

Answer: D

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3. If $x = a\cos^3\theta$ and $y = a\sin^3\theta$, then $\frac{dy}{dx} =$

A. $3\sqrt{\frac{y}{x}}$

B. $-3\sqrt{\frac{x}{y}}$

C. $3\sqrt{\frac{x}{y}}$

D. $-3\sqrt{\frac{y}{x}}$.

Answer: D

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4. If $y = \tan^{-1}\sqrt{x^2 - 1}$, then the ratio $\frac{d^2y}{dx^2} : \frac{dy}{dx} =$

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

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

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

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

Answer: C

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5. If $\sqrt{r} = ae^{\theta\cot\alpha}$ where a and α are real numbers then $\frac{d^2r}{d\theta^2} - 4r\cot^2\alpha$ is

A. r

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

C. 1

D. 0

Answer: D

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

A. 2

B. -1

C. 0

D. -2

Answer: B

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7. $\frac{d}{dx}\left[\cos^2\left(\cot^{-1}\sqrt{\frac{2+x}{2-x}}\right)\right]$

A. $\frac{1}{4}$

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

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

D. $\frac{-3}{4}$.

Answer: A

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8. If $f(x) = \left(\frac{\sin^2 x}{1+\cot x}\right) + \frac{\cos^2 x}{1+\tan}$, then $f'\left(\frac{\pi}{4}\right)$ is :

A. $\sqrt{3}$

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

C. 0

D. $-\sqrt{3}$

Answer: C

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9. If $\cos^{-1}\left(\frac{y}{b}\right) = n\log\left(\frac{x}{n}\right)$, then :

A. $y_1 = x\sqrt{b^2 - y^2}$

B. $xy_1 - \sqrt{b^2 - y^2} = 0$

C. $xy_1 = n\sqrt{b^2 - y^2}$

D. $xy_1 + n\sqrt{b^2 - y^2} = 0.$

Answer: D

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10. $f(x) = 2a - x$ in $-a < x < a = 3x - 2a$ in $a \leq x.$

Then which of the following is true ?

A. $f(x)$ is not diffrentiable at $x = a$

B. $f(x)$ is continuous at $x = a$

C. $f(x)$ is continuous for all $x < a$

D. $f(x)$ is differentiable for all $x \geq a$.

Answer: A

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11. If $x + y = \tan^{-1} y$ and $\frac{d^2y}{dx^2} = f(y)\frac{dy}{dx}$, then $f(y) =$

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

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

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

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

Answer: B

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12. Let $f(x) = \cos^{-1}\left[\frac{1}{\sqrt{13}}(2\cos x - 3\sin x)\right]$. Then f(0.5) =

A. 0.5

B. 1

C. 0

D. -1

Answer: B

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13. If $y = (1+x)(1+x^2)(1+x^4)$, then $\frac{dy}{dx}$ at $x = 1$ is :

A. 28

B. 1

C. 20

D. 1

Answer: A

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14. If $y = \left(\tan^{-1} x\right)^2$ then show that $\left(x^2+1\right)^2 \frac{d^2y}{dx^2} + 2x\left(x^2+1\right)\frac{dy}{dx} = 2$

A. 0

B. 1

C. 4

D. 2

Answer: D

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15. If the function $f(x)$ defined by

$$f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \ldots . + \frac{x^2}{2} + x + 1,$$ then

$f'(0) =$

A. 100

B. -1

C. $100f'(0)$

D. 1

Answer: D

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16. Which of the following functions is differentiable at $x = 0$. ?

A. $\cos(|x|) + |x|$

B. $\cos(|x|) - |x|$

C. $\sin(|x|) + |x|$

D. $\sin(|x|) - |x|$.

Answer: D

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17. If $x = a(\cos t + \log \tan t/2), y = a \sin t,$ then $\frac{dy}{dx} =$

A. $\tan t$

B. $\cot t$

C. $-\cot t$

D. $-\tan t.$

Answer: A

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18. If $f(x) = x\tan^{-1}x$, then $\lim_{x\to 1}\dfrac{f(x)-f(1)}{x-1} =$

A. $\dfrac{\pi+3}{4}$

B. $\dfrac{x}{4}$

C. $\dfrac{\pi+1}{4}$

D. $\dfrac{\pi+2}{4}$

Answer: D

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19. If $f(y) = f\left(x^2+2\right)$ and $f'(3) = 5$, then $\dfrac{dy}{dx}$ at $x = 1$ is :

A. 5

B. 25

C. 15

D. 10

Answer: D

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20. If $x = a\cos^3\theta, y = a\sin^3\theta,$ then $1 + \left(\frac{dy}{dx}\right)^2$ is

_____

A. $\tan\theta$

B. $\tan^2\theta$

C. $\sec^2\theta$

D. 1

Answer: C

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21. If the function $g(x)$ is defined by

$$g(x) = \frac{x^{200}}{200} + \frac{x^{199}}{199} + \frac{x^{198}}{198} + ... + \frac{x^2}{2} + x + 5,$$

then $g'(0)$ = _____.

A. 1

B. 200

C. 100

D. 5

Answer: A

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22. If $f(x) = 2x^2$, find $\frac{f(3.8) - f(4)}{3.8 - 4}$:

A. 1.56

B. 156

C. 15.6

D. 0.156

Answer: D

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23. If $x = ct$ and $y = \frac{c}{t}$, find $\frac{dy}{dx}$ at t=2.

A. $\frac{1}{4}$

B. 4

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

D. 0

Answer: C

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

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

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

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

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

Answer: A

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

A. 0

B. 1

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

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

Answer: D

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