



MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

METHODS OF DIFFERENTIATION

Question Bank

1. Let $f: (-5, 5) \rightarrow \mathbb{R}$ be a differentiable function with $f(4) = 1$, $f'(4) = 1$, $f(0) = -1$ and $f''(0) = 1$, If $g(x) = f(2f^2(x)+2)^2$, then $-g''(0)$ equals

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2. Let $f(x) = (2x - \pi)^3 + 2x - \cos x$. If the value of $\frac{d}{dx}(f^{-1}(x))$ at $x = \pi$ can be expressed in the form of p/q (where p and q are natural

numbers in their lowest form), then the value of $(P+q)$ is



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3. Let $g: R \rightarrow R$ be given by $g(x) = e^{2x} + 3x + \sin x + 1$. If g^{-1} is the inverse function of g , then find the value of $\frac{1}{g^{-1}{}'(2)}$.



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4. Let $e^y = \left(\frac{\sqrt{1+\alpha} - \sqrt{1-\alpha}}{\sqrt{1+\alpha} + \sqrt{1-\alpha}} \right)$ and $\tan\left(\frac{x}{2}\right) = \sqrt{\frac{1-\alpha}{1+\alpha}}$, $\alpha \in [-1, 0) \cup (0, 1]$ then find $\left. \frac{dy}{dx} \right|_{x=\frac{\pi}{3}}$



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5. If $y = y(x)$ and it follows the relation $4xe^{xy} = y + 5\sin^2 x$, then $y'(0)$ is equal to



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6. If $f(1) = g(1) = 1$, then derivative of $(f(g(x))^2)$ w.r.t. $(g(f(x))^2)$ at $x = 1$ is (where $f'(1) \neq 0$ and $g'(1) \neq 0$)`

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7. $y = \sqrt{\sqrt{x}\sqrt{x^2}\sqrt{x^3}\sqrt{x^4}\sqrt{x^5}\dots\infty)}$, then (dy/dx) at $x = 2$ is equal to

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8. Let $f(x) = \frac{a\sqrt[3]{x} + bx}{\sqrt[3]{x^2}}$ and $f'(8) = 0$, then value of a/b is equal to

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9. Let a function $y = f(x)$ is defined by $y = e^{m\sqrt{t}}$ in t and $x = e^t$, where t is a positive real parameter such that $f'(0) = e$, then value of m is

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10. Let $f(x) = \lim_{t \rightarrow 0} \frac{1}{t} \left(\tan^{-1} \left(\frac{1}{x+t} \right) - \tan^{-1} \left(\frac{1}{x} \right) \right)$, then absolute value of $f(0)$ equals

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11. Let $x = f(t)$ and $y = g(t)$, where x and y are twice differentiable function. If $f'(0) = g'(0) = f''(0) = 2, g(0) = 6$, then the value of $\left(\frac{d^2y}{(dx^2)} \right)_{t=0}$ is equal to

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12. If $f(x) = \sin \left(\frac{5\pi}{3} [x] - x \right)$, then $-f'(\pi)$ is equal to [Note. $[\alpha]$ denotes the greatest integer less than or equal to α]

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13. If $f(x)$ is twice differentiable and $f''(0) = 3$, then

$$\lim_{x \rightarrow 0} \frac{2f(x) - 3f(2x) + f(4x)}{x^2} \text{ is}$$

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14. If $f(x) = 2x^3 + 7x - 5$ and $g(x) = f^{-1}(x)$, then reciprocal of $g'(4)$ is equal to

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15. If $e^y = e^x \cdot x^{-y}$, the value of $dy/dx|_{(x=e)}$ is

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16. For the curve represented implicitly as $4^x - 2^y = 1$, the value of

$$\lim_{x \rightarrow \infty} \left(\frac{dy}{dx} \right) \text{ is equal to}$$



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17. Let $y(x) = e^{2\sin^{-1}x}$, $x \in [-1, 1]$ and $(-x^2)y''(x) = xy'(x) + \lambda y(x)$, then λ equals



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18. Suppose the function $f(x)-f(2x)$ has the derivative 5 at $x=1$ and derivative 7 at $x=2$. The derivative of the function $f(x)-f(4x)$ at $x=1$, has the value equal to



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19. Let $h(x)$ be differentiable for all x and let $f(x) = (kx - e^x)h(x)$ where k is some constant. If $h(0) = 5$, $h'(0) = -2$ and $f'(0) = 18$ then the value of k is equal to



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20. If f and g are differentiable functions such that $g'(a) = 2$ and $g(a) = b$ and if $f \circ g$ is an identity function then $f'(b)$ has the value equal to

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21. If $\phi(x) = x \cdot \sin x$ then $\lim_{x \rightarrow \pi/2} (\phi(x) - \phi(\pi/2)) / (x - \pi/2) =$

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22. If

$f(x) = \sqrt{x + 3 - 4\sqrt{x - 1}} + \sqrt{x + 8 - 6\sqrt{x - 1}}$, then the absolute value of $f'(x)$ at $x = 1.5$ is

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23. If for a continuous function $f(0)=f(1)=0$ and $f'(1) = 2$ and $g(x) = f(e^x) \cdot e^{f(x)}$, then $g'(0)$ is equal to

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24. If $y(x) = \frac{1}{1+x} + \frac{x}{(1+x)^2} - \frac{x}{(1+x)^3} - \dots - \frac{x}{(1+x)^{20}}$, then $(d^2y)/(dx^2)$ at $x = 0$ equals

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25. If $f'(5) = 7$ then $\lim_{t \rightarrow 0} (f(5+t) - f(5-t))/2t$

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26. If $f(x) = g(x)$ and $g'(x) = -f(x)f$ or *all real x* and $f(5)=2=f'(5)$ then $f''(10)+g''(10)$ is

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27.

Let

$$x^6 + bx^5 + cx^4 + dx^3 + ex^2 + fx + g = \begin{vmatrix} (x+1)(x^2+2)(x^2+x) \\ (x^2+x)(x^2+1)(x^2+2) \\ (x^2+2)(x^2+x)(x+1) \end{vmatrix}$$

, then $f+g =$



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28. If $y = \tan \theta + \cot \theta$, $x = \tan \theta - \cot \theta$, where θ is a parameter, then

$y^3 \frac{d^2y}{dx^2}$ is equal to



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29. If $y^2 = 3 \cos^2 x + 2 \sin^2 x$, then the value of $y^4 + y^3 \frac{d^2y}{dx^2}$ can be



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