



MATHS

BOOKS - NTA MOCK TESTS

DIFFERENTIAL COEFFICIENT TEST

Single Choice

1. 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

A. 0

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

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

D. 1

Answer: C

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

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

B. $\frac{1}{4\sqrt{x} (\sec \sqrt{x})^{\frac{1}{2}} \cdot \tan \sqrt{x}}$

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

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

Answer: B



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3. If $f(x) = x^n$, where $n \in N$ then the value of

$$f(1) - \frac{f^1(1)}{1!} + \frac{f^2(1)}{2!} - \frac{f^3(1)}{3!} + \dots$$

$$\dots + \frac{(-1)^n \cdot f^n(1)}{n!} \text{ is (where } f^n(x) \text{ represents}$$

n th order derivative of $f(x)$)

A. 2^n

B. 2^{n-1}

C. 0

D. 1

Answer: C



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

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

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

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

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

Answer: C



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5. If $y = \sin px$ and y_n is the n th derivative of y

then $\begin{vmatrix} y & y_1 & y_2 \\ y_3 & y_4 & y_5 \\ y_6 & y_7 & y_8 \end{vmatrix}$ is equal to

A. 1

B. 0

C. -1

D. None of these

Answer: B



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6. If $y = \sin[\cos^{-1}\{\sin(\cos^{-1}(\cos^{-1}x))\}]$, then $\frac{dx}{dy}$ at $x = \frac{1}{2}$ is equal to

A. -1

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

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

D. 1

Answer: D



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7. If $y = \sin(\log_e x)$, then $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx}$ is equal to

A. $\sin(\log_e x)$

B. $\cos(\log_e x)$

C. y^2

D. $-y$

Answer: D



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8. If $y = \log^n x$, where \log^b means $\log \log \log \dots$

(repeated n times), then

$x \log x \log^2 x \log^3 x \dots \log^{n-1} x \log^n x \frac{dy}{dx}$ is equal

to

A. $\log x$

B. $\log^n x$

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

D. 1

Answer: B



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9.

If

$$y = \frac{1}{1 + x^{n-m} + x^{p-m}} + \frac{1}{1 + x^{m-n} + x^{p-n}},$$

then $\frac{dy}{dx}$ is $+$ $\frac{1}{1 + x^{m-p} + x^{n-p}}$ equal to

A. 1

B. 0

C. $m + n + p$

D. $m - n + p$

Answer: B



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10. A differentiable function $f(x)$ is defined for all $x > 0$ and satisfies $f(x^3) = 4x^4$ for all $x > 0$. The value of $f'(8)$ is

A. $\frac{16}{3}$

B. $\frac{32}{3}$

C. $\frac{16\sqrt{2}}{3}$

D. $\frac{32\sqrt{2}}{3}$

Answer: B



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11.

If

$$f(x) = \frac{g(x) + g(-x)}{2} + \frac{2}{[h(x) + h(-x)]^{-1}}$$

where g and h are differentiable function, then

$f'(0)$ is

A. 1

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

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

D. 0

Answer: D



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12. 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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13. If $f''(x) = -f(x)$ where $f(x)$ is a continuous double differentiable function and $g(x) = f'(x)$. If

$$F(x) = \left(f\left(\frac{x}{2}\right)\right)^2 = \left(g\left(\frac{x}{2}\right)\right)^2 \quad \text{and} \quad F(5) = 5,$$

then $F(10)$ is

A. 0

B. 5

C. 10

D. 25

Answer: B



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14. If $f(x) = \begin{vmatrix} x^3 & x^4 & 3x^2 \\ 1 & -6 & 4 \\ p & p^2 & p^3 \end{vmatrix}$ where p is a constant

then $\frac{d^4 f(x)}{dx^4}$ is

- A. proportional to x^2
- B. proportional to x
- C. proportional to x^3
- D. a constant

Answer: D



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

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

Answer: A



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16. If $u = x^2 + y^2$ and $x = s + 3t$, $y = 2s - t$ then

$\frac{d^2u}{ds^2}$ is equal to (where t is a constant)

A. 12

B. 32

C. 36

D. 10

Answer: D



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17.

If

$$f(x) = (\log_{\cot x} \tan x)(\log_{\tan x} \cot x)^{-1} + \frac{\tan^{-1}(4x)}{4 - x^2}$$

, then $f'(2)$ is equal to

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

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

C. 1

D. -1

Answer: A



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18. If $y = \frac{1}{x}$ then the value of $\frac{dy}{\sqrt{1+y^4}} + \frac{dx}{\sqrt{1+x^4}} + 3$ is equal to

A. 0

B. 3

C. 4

D. -3

Answer: B



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

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

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

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

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

Answer: B



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20. The derivative of the function

$$f(x) = \cos^{-1} \left\{ \frac{1}{\sqrt{3}} (2 \cos x - 3 \sin x) \right\}$$

$$+ \sin^{-1} \left\{ \frac{1}{\sqrt{3}} (2 \sin x + 3 \cos x) \right\} \quad (\text{where}$$

$0 < x < \cos^{-1}(3/13))$ with respect to $\sqrt{1+x^2}$ is

A. $2x$

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

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

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

Answer: C



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21. If $f(x) = \sin(\sin x)$ and

$\cot x f''(x) + f'(x) + g(x)\cot x = 0$, then $g(x)$

is

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

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

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

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

Answer: D



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22. If $f(x) = \cos x \cos 2x \cos 4x \cos 8x \cos 16x$,

then $f'\left(\frac{\pi}{4}\right)$ is (where $f'(x) = \frac{d}{dx}f(x)$)

A. $\sqrt{2}$

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

C. 1

D. None of these

Answer: A



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23. If $y = \log(x^3) + 3 \sin^{-1} x + kx^2$ and $\frac{dy}{dx}$ at $x = \frac{1}{2}$ is $2\sqrt{3}$, then the value of k is equal to

A. 6

B. -6

C. $2\sqrt{3}$

D. -3

Answer: B



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24. If $2x^3 - 3x^2y^2 + 4x - y + 7 = 0$ and $y(1) = 1$,

then the value of $y''(1)$ is equal to

A. $-\frac{343}{474}$

B. $\frac{474}{343}$

C. $\frac{474}{343}$

D. $\frac{343}{474}$

Answer: B



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25. If $f(x) = \left(\frac{x^a}{x^b}\right)^{a+b} \cdot \left(\frac{x^b}{x^c}\right)^{b+c} \cdot \left(\frac{x^c}{x^a}\right)^{c+a}$

,then $f'(x)$ is equal to

A. 1

B. 0

C. x^{a+b+c}

D. None of these

Answer: B



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26. Find $\frac{d}{dx} \left[\tan^{-1} \left(\frac{\cos x - \sin x}{\cos x + \sin x} \right) \right]$

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

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

C. 1

D. -1

Answer: D



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27. If $y = a \sin x + b \cos x$ then $y^2 + \left(\frac{dy}{dx} \right)^2$ is a

A. Function of x

B. Function of y

C. Function of x and y

D. Constant

Answer: D



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28. If $f(x) = x^2 - 3x$, then the points at which $f(x) = f'(x)$ are

A. 1, 3

B. 1, - 3

C. - 1, 3

D. None of these

Answer: D



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29. If $x = \cos^3 \theta$ and $y = \sin^3 \theta$ then $1 + \left(\frac{dy}{dx}\right)^2$ is equal to

A. $\tan^2 \theta$

B. $\cot^2 \theta$

C. $\sec^2 \theta$

D. $\cos ec^2 \theta$

Answer: C



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30. Let $f(x) = (x^3 + 2)^{30}$. If $f^n(x)$ is a polynomial of degree 20, where $f^n(x)$ denotes the n th order derivative of $f(x)$ with respect to x , then the value of n can be

A. 60

B. 40

C. 70

D. 50

Answer: C



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