Sample Task **Questions**

Questions with Answer Keys **MathonGo**

Q1

If $x = \frac{1-t^2}{1+t^2}$ and $y = \frac{2t}{1+t^2}$, then $\frac{dy}{dx}$ is equal to

(1) $-\frac{y}{x}$

(2) $\frac{y}{x}$

(3) $-\frac{x}{y}$

(4) $\frac{x}{y}$

Q2

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

(1) $\frac{x}{y}$

(2) $-\frac{y}{x}$

(3) $-\frac{x}{y}$

(4) $\frac{y}{x}$

Q3

If $y = a\cos(\log x) + b\sin(\log x)$, where $a\&b$ are parameters, then $x^2y'' + xy'$ is equal to

(1) y

(2) $-y$

(3) $2y$

(4) $-2y$

Q4

If $\phi(x) = \log_8 \log_3 x$, then $\phi'(e)$ is equal to

(1) $e\log 8$

(2) $-e\log 8$

(3) $\frac{1}{e\log\ 8}$

(4) None of these

Q5

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

(1) $\frac{1}{x\log_e\ 10} - \frac{\log_e\ 10}{x\left(\log_e x\right)^2}$

(2) $\frac{1}{x\log_e\ 10} - \frac{1}{x\log_{10} e}$

(3) $\frac{1}{x\log_e\ 10} - \frac{\log_e\ 10}{x\left(\log_e x\right)}$

(4) None of these

Q6

If $f: R \rightarrow R$ is a function defined as $f\left(x^3\right) = x^5, \forall x \in R - \{0\}$ and $f(x)$ is differentiable $\forall x \in R$ then the value of $\frac{1}{4}f'(27)$ is equal to (here f' represents the derivative of f)

Q7

If $y = 2 + \sqrt{\sin x + 2 + \sqrt{\sin x + 2 + \sqrt{\sin x + \ldots\infty}}}$, then the value of $\frac{dy}{dx}$ at $x = 0$ is

(1) 0

(2) 2

(3) $\frac{1}{2}$

(4) $\frac{1}{3}$

Q8

If $x = 3\cos t$ and $y = 5\sin t$, where t is a parameter, then $9\frac{d^2y}{dx^2}$ at $t = -\frac{\pi}{6}$ is equal to

Q9

If $y = x^2 + \cfrac{1}{x^2 + \cfrac{1}{x^2 + \cfrac{1}{x^2 + \ldots \infty}}}$, then the value of $\frac{dy}{dx}$ is:

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

(2) $\frac{xy}{y + x^2}$

(3) $\frac{xy}{y - x^2}$

(4) $\frac{2xy}{2y + x^2}$

Q10

If $f(x) = \left(\frac{2+x}{1+x}\right)^{1+x}$, then $f'(0)$ is equal to

(1) 2log2

(2) log2

(3) 3log2 − 1

(4) 2log2 − 1

Q11

If $x^3 + y^3 = t + \frac{4}{t}$ and $x^6 + y^6 = t^2 + \frac{16}{t^2}$ then find $\left|x^4y^2\frac{dy}{dx}\right|$.

Q12

Let $f(x)$ be a polynomial of degree 3 such that $f(3) = 21, f'(3) = 30, f''(3) = 22$ and $f'''(3) = 6$. Find the value of $f'(2)$.

Q13

Find the value of $(fgh)'(0)$, if f, g and h are differentiable functions with $f(0) = 1,\ g(0) = 2,\ h(0) = 3$ and the derivatives of their pair wise products at $x = 0$ are $(fg)'(0) = 6,\ (gh)'(0) = 4$ and $(hf)'(0) = 5$.

Q14

Let $f: \mathbb{R} \to \mathbb{R}$ satisfy $f(x + y) = 2^x f(y) + 4^y f(x),\ \forall x, y \in \mathbb{R}$. If $f(2) = 3$, then $14 \cdot \frac{f'(4)}{f'(2)}$ is equal to _____.

Q15

Find the value of $f^2(4) + g^2(4)$, if $f'(x) = g(x)$ and $g'(x) = -f(x)$ for all x and $f(2) = 4 = f'(2)$.

Q16

If for $x \in (0, 1/4)$, derivative of $\tan^{-1}\left(\frac{6x\sqrt{x}}{1-9x^3}\right)$ is $\sqrt{x} \cdot g(x)$ then $g(x)$ is equal to.

(1) $\frac{3}{1+9x^3}$

(2) $\frac{9}{1+9x^3}$

(3) $\frac{3x\sqrt{x}}{1-9x^3}$

(4) $\frac{3x}{1-9x^3}$

Q17

If $y = e^{nx}$, then $\left(\frac{d^2y}{dx^2}\right)\frac{d^2x}{dy^2}$ is equal to

(1) ne^{nx}

(2) ne^{-nx}

(3) 1

(4) $-ne^{-nx}$

Q18

Let $\phi(x)$ be the inverse of the function $f(x)$ and $f'(x) = \frac{1}{1+x^5}$, then $\frac{d}{dx}\phi(x)$ is equal to

(1) $\frac{1}{1+[\phi(x)]^5}$

(2) $\frac{1}{1+[f(x)]^5}$

(3) $1 + [\phi(x)]^5$

(4) $1 + f(x)$

Q19

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

(1) $\frac{x}{y}$

(2) $\frac{y}{x}$

(3) $\frac{x+y}{xy}$

(4) xy

Q20

If $f(x) = x^3 + 3x + 1$ and $g(x)$ is the inverse function of $f(x)$, then the value of $g'(5)$ is equal to

(1) 3

(2) $\frac{1}{3}$

(3) $\frac{1}{6}$

(4) 6

Q21

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

(1) 0

(2) - 2

(3) 4

(4) -4

Q22

$f(x)$ and $g(x)$ are two differential function on [0, 2] such that $f''(x) - g''(x) = 0, f'(1) = 2g'(1) = 4, f(2) = 3g(2) = 9$ then $f(x) - g(x)$ at $x = \frac{3}{2}$ is

(1) 0

(2) 2

(3) 10

(4) 5

Q23

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

(1) $\log 2$

(2) $-\log 2$

(3) -1

(4) 1

Q24

If $2y = \left(\cot^{-1}\left(\frac{\sqrt{3}\cos x + \sin x}{\cos x - \sqrt{3}\sin x}\right)\right)^2 \forall x \in \left(0, \frac{\pi}{2}\right)$, then $\frac{dy}{dx}$ is equal to

(1) $\frac{\pi}{6} - x$

(2) $2x - \frac{\pi}{3}$

(3) $x - \frac{\pi}{6}$

(4) None of these

Q25

If $y = y(x)$ is an implicit function of x such that $\log_e(x + y) = 4xy$, then $\frac{d^2y}{dx^2}$ at $x = 0$ is equal to

Q26

Let, $f: R \to R$ be a function such that $f(x) = x^3 + x^2 f'(1) + x f''(2) + f'''(3), \ \forall x \in R$. Then $f(2)$ equals

(1) 30

(2) 8

(3) -4

(4) -2

Q27

Let f be a differentiable function such that $8f(x) + 6f\left(\frac{1}{x}\right) - x = 5(x \neq 0)$ and $y = x^2 f(x)$, then $\frac{dy}{dx}$ at $x = -1$ is

(1) $\frac{15}{14}$

(2) $-\frac{15}{14}$

(3) $-\frac{1}{14}$

(4) $\frac{1}{14}$

Q28

For $x > 1$, if $(2x)^{2y} = 4e^{2x-2y}$, then $\left(1 + \log_e 2x\right)^2 \frac{dy}{dx}$ is equal to

(1) $\log_e 2x$

(2) $\frac{x\log_e 2x - \log_e 2}{x}$

(3) $x\log_e 2x$

(4) $\frac{x\log_e 2x + \log_e 2}{x}$

Q29

Let $y = f(x)$ is an invertible function satisfying $f(1) = 5$, $f'(1) = 2$, $f''(1) = 4$, then the absolute value of

2. $\left(f^{-1}\right)''(5)$ is equal to

Q30

If $y(x) = \left(x^x\right)^x, x > 0$ then $\frac{d^2x}{dy^2} + 20$ at $x = 1$ is equal to

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Answer Key

Q1 (3)	**Q2** (4)	**Q3** (2)	**Q4** (3)
Q5 (1)	**Q6** (3.75)	**Q7** (4)	**Q8** (40)
Q9 (1)	**Q10** (4)	**Q11** (4)	**Q12** (11)
Q13 (16)	**Q14** (248)	**Q15** (32)	**Q16** (2)
Q17 (4)	**Q18** (3)	**Q19** (2)	**Q20** (3)
Q21 (4)	**Q22** (4)	**Q23** (3)	**Q24** (4)
Q25 (40)	**Q26** (4)	**Q27** (3)	**Q28** (2)
Q29 (1)	**Q30** (16)		