Q.1 If g is the inverse of f & $f'(x) = \frac{1}{1+x^5}$ then $g'(x) =$

(A) $1 + [g(x)]^5$ (B) $\frac{1}{1 + [g(x)]^5}$ (C) $-\frac{1}{1 + [g(x)]^5}$ (D) none

Q.2 If $y = \tan^{-1}\left(\frac{\ell n \frac{e}{x^2}}{\ell n e x^2}\right) + \tan^{-1}\frac{3 + 2\ell n x}{1 - 6\ell n x}$ then $\frac{d^2y}{dx^2} =$

(A) 2 (B) 1 (C) 0 (D) -1

Q.3 If $y = f\left(\frac{3x+4}{5x+6}\right)$ & $f'(x) = \tan x^2$ then $\frac{dy}{dx} =$

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

(C) $f\left(\frac{3\tan x^2 + 4}{5\tan x^2 + 6}\right)\tan x^2$ (D) none

Q.4 If $y = \sin^{-1}\left(x\sqrt{1-x} + \sqrt{x}\sqrt{1-x^2}\right)$ & $\frac{dy}{dx} = \frac{1}{2\sqrt{x(1-x)}} + p$, then $p =$

(A) 0 (B) $\sin^{-1} x$ (C) $\sin^{-1}\sqrt{x}$ (D) none of these

Q.5 If $y = f\left(\frac{2x-1}{x^2+1}\right)$ & $f'(x) = \sin x$ then $\frac{dy}{dx} =$

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

(C) $\frac{1 - x + x^2}{\left(1 + x^2\right)^2}\sin\left(\frac{2x-1}{x^2+1}\right)$ (D) none

Q.6 Let g is the inverse function of f & $f'(x) = \frac{x^{10}}{\left(1 + x^2\right)}$. If $g(2) = a$ then $g'(2)$ is equal to

(A) $\frac{5}{2^{10}}$ (B) $\frac{1 + a^2}{a^{10}}$ (C) $\frac{a^{10}}{1 + a^2}$ (D) $\frac{1 + a^{10}}{a^2}$

Q.7 If $\sin(xy) + \cos(xy) = 0$ then $\frac{dy}{dx} =$

(A) $\frac{y}{x}$ (B) $-\frac{y}{x}$ (C) $-\frac{x}{y}$ (D) $\frac{x}{y}$

Q.8 If $y = \sin^{-1}\frac{2x}{1+x^2}$ then $\left.\frac{dy}{dx}\right]_{x=-2}$ is :

(A) $\frac{2}{5}$ (B) $\frac{2}{\sqrt{5}}$ (C) $-\frac{2}{5}$ (D) none

Q.9 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) 4 (B) 1/4 (C) 1 (D) none

Q.10 If $y^2 = P(x)$, is a polynomial of degree 3, then $2\left(\frac{d}{dx}\right)\left(y^3 \cdot \frac{d^2y}{dx^2}\right)$ equals :

(A) $P'''(x) + P'(x)$ (B) $P''(x) \cdot P'''(x)$ (C) $P(x) \cdot P'''(x)$ (D) a constant

Q.11 Let f(x) be a quadratic expression which is positive for all real x . If $g(x) = f(x) + f'(x) + f''(x)$, then for any real x, which one is correct .

(A) $g(x) < 0$ (B) $g(x) > 0$ (C) $g(x) = 0$ (D) $g(x) \geq 0$

Q.12 If $x^p \cdot y^q = (x+y)^{p+q}$ then $\frac{dy}{dx}$ is :

(A) independent of p but dependent on q
(B) dependent on p but independent of q
(C) dependent on both p & q
(D) independent of p & q both .

Q.13 Let $f(x) = \begin{cases} g(x) \cdot \cos\frac{1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ where g(x) is an even function differentiable at x = 0, passing through the origin . Then $f'(0)$:

(A) is equal to 1 (B) is equal to 0 (C) is equal to 2 (D) does not exist

Q.14 If $y = \frac{1}{1+x^{n-m}+x^{p-m}} + \frac{1}{1+x^{m-n}+x^{p-n}} + \frac{1}{1+x^{m-p}+x^{n-p}}$ then $\frac{dy}{dx}$ at $e^{m^{np}}$ is equal to:

(A) e^{mnp} (B) $e^{mn/p}$ (C) $e^{np/m}$ (D) none

Q.15 $\lim\limits_{x\to 0} \frac{\log_{\sin^2 x}\cos x}{\log_{\sin^2\frac{x}{2}}\cos\frac{x}{2}}$ has the value equal to

(A) 1 (B) 2 (C) 4 (D) none of these

Q.16 If f is differentiable in (0, 6) & $f'(4) = 5$ then $\lim\limits_{x\to 2} \frac{f(4) - f(x^2)}{2-x} =$

(A) 5 (B) 5/4 (C) 10 (D) 20

Q.17 Let $l = \underset{x\to 0^+}{\text{Lim}}\ x^m (\ln x)^n$ where m, n $\in$ N then :

(A) l is independent of m and n (B) l is independent of m and depends on m

(C) l is independent of n and dependent on m (D) l is dependent on both m and n

Q.18 Let $f(x) = \begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x^2 & 2x \\ \tan x & x & 1 \end{vmatrix}$. Then $\underset{x\to 0}{\text{Limit}} \dfrac{f'(x)}{x} =$

(A) 2 (B) -2 (C) -1 (D) 1

Q.19 Let $f(x) = \begin{vmatrix} \cos x & \sin x & \cos x \\ \cos 2x & \sin 2x & 2\cos 2x \\ \cos 3x & \sin 3x & 3\cos 3x \end{vmatrix}$ then $f'\left(\dfrac{\pi}{2}\right) =$

(A) 0 (B) -12 (C) 4 (D) 12

Q.20 People living at Mars, instead of the usual definition of derivative D f(x), define a new kind of derivative, D*f(x) by the formula

$D^*f(x) = \underset{h\to 0}{\text{Limit}} \dfrac{f^2(x+h) - f^2(x)}{h}$ where $f^2(x)$ means $[f(x)]^2$. If $f(x) = x\,\ln x$ then

$D^*f(x)\big|_{x=e}$ has the value

(A) e (B) 2e (C) 4e (D) none

Q.21 If $f(4) = g(4) = 2$; $f'(4) = 9$; $g'(4) = 6$ then $\underset{x\to 4}{\text{Limit}} \dfrac{\sqrt{f(x)} - \sqrt{g(x)}}{\sqrt{x} - 2}$ is equal to :

(A) $3\sqrt{2}$ (B) $\dfrac{3}{\sqrt{2}}$ (C) 0 (D) none

Q.22 If f(x) is a differentiable function of x then $\underset{h\to 0}{\text{Limit}} \dfrac{f(x+3h) - f(x-2h)}{h} =$

(A) $f'(x)$ (B) $5f'(x)$ (C) 0 (D) none

Q.23 If $y = x + e^x$ then $\dfrac{d^2x}{dy^2}$ is :

(A) e^x (B) $-\dfrac{e^x}{(1+e^x)^3}$ (C) $-\dfrac{e^x}{(1+e^x)^2}$ (D) $\dfrac{-1}{(1+e^x)^3}$

Q.24 If $x^2y + y^3 = 2$ then the value of $\dfrac{d^2y}{dx^2}$ at the point (1, 1) is :

(A) $-\dfrac{3}{4}$ (B) $-\dfrac{3}{8}$ (C) $-\dfrac{5}{12}$ (D) none

Q.25 If $f(a) = 2$, $f'(a) = 1$, $g(a) = -1$, $g'(a) = 2$ then the value of $\underset{x\to a}{\text{Limit}} \dfrac{g(x)\,.\,f(a) - g(a)\,.\,f(x)}{x - a}$ is:

(A) -5 (B) 1/5 (C) 5 (D) none

Q.26 If f is twice differentiable such that $f''(x) = -f(x), f'(x) = g(x)$
$h'(x) = [f(x)]^2 + [g(x)]^2$ and
$h(0) = 2, h(1) = 4$

then the equation $y = h(x)$ represents :

(A) a curve of degree 2
(B) a curve passing through the origin
(C) a straight line with slope 2
(D) a straight line with y intercept equal to -2.

Q.27 The derivative of the function, $f(x)=\cos^{-1}\left\{\frac{1}{\sqrt{13}}(2\cos x - 3\sin x)\right\} + \sin^{-1}\left\{\frac{1}{\sqrt{13}}(2\cos x + 3\sin x)\right\}$

w.r.t. $\sqrt{1+x^2}$ at $x = \frac{3}{4}$ is :

(A) $\frac{3}{2}$ (B) $\frac{5}{2}$ (C) $\frac{10}{3}$ (D) 0

Q.28 Let f(x) be a polynomial in x . Then the second derivative of $f(e^x)$, is :

(A) $f''(e^x) \cdot e^x + f'(e^x)$
(B) $f''(e^x) \cdot e^{2x} + f'(e^x) \cdot e^{2x}$
(C) $f''(e^x)\, e^{2x}$
(D) $f''(e^x) \cdot e^{2x} + f'(e^x) \cdot e^x$

Q.29 The solution set of $f'(x) > g'(x)$, where $f(x) = \frac{1}{2}(5^{2x+1})$ & $g(x) = 5^x + 4x(\ln 5)$ is :

(A) $x > 1$ (B) $0 < x < 1$ (C) $x \le 0$ (D) $x > 0$

Q.30 If $y = \sin^{-1}\frac{x^2-1}{x^2+1} + \sec^{-1}\frac{x^2+1}{x^2-1}$, $|x| > 1$ then $\frac{dy}{dx}$ is equal to :

(A) $\frac{x}{x^4-1}$ (B) $\frac{x^2}{x^4-1}$ (C) 0 (D) 1

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	A	C	B	D	B	B	B	C	A	C
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	D	B	D	C	D	A	B	C	C
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A	B	B	B	C	C	C	D	D	C