1. 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

2. Let $f(x)=e^x$, $g(x)=\sin^{-1} x$ and $h(x)=f[g(x)]$, then $\frac{h'(x)}{h(x)}$ is equal to

(1) $e^{\sin^{-1} x}$
(2) $\frac{1}{\sqrt{1-x^2}}$
(3) $\sin^{-1} x$
(4) $\frac{1}{(1-x^2)}$

3. If $y=\tan^{-1}\left(\frac{2^x}{1+2^{2x+1}}\right)$, then $\frac{dy}{dx}$ at $x=0$ is $k\ \log\frac{1}{2}$ then find k.

4. The function $f(x)=e^x+x$, being differentiable and one-one, has a differentiable inverse $f^{-1}(x)$ The value of $\frac{d}{dx}\left(f^{-1}\right)$ at the point $f(\log 2)$ is

(1) $\frac{1}{\ln 2}$
(2) $\frac{1}{3}$
(3) $\frac{1}{4}$
(4) 1

5. If $f(x)=x+\tan x$ and f is inverse of g then $g'(x)$ is equal to

(1) $\frac{1}{1+(g(x)-x)^2}$
(2) $\frac{1}{2-(g(x)-x)^2}$
(3) $\frac{1}{2+(g(x)-x)^2}$
(4) None of these

6. The derivative of $y=(1-x)(2-x)\ldots(n-x)$ at $x=1$ is equal to

(1) $(-1)(n-1)!$
(2) $n!-1$
(3) $(-1)^{n-1}(n-1)!$
(4) $(-1)^n\ (n-1)!$

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

(1) function of x
(2) function of y
(3) function of x and y
(4) constant

8. Let, $\mathrm{g}\ :\ \mathrm{R}\rightarrow\mathrm{R}$ be a differentiable function satisfying $\mathrm{g(x)=g(y)g(x-y)}\ \forall\ \mathrm{x,y}\in\mathrm{R}$ and g'(0)= a and g'(3)= b then g'(− 3) is

(1) $\frac{\mathrm{a}^2}{\mathrm{b}}$
(2) $\frac{\mathrm{a}}{\mathrm{b}}$
(3) $\frac{\mathrm{b}}{\mathrm{a}}$
(4) none of these

9. If $x=2\sin\theta-\sin 2\theta$ and $y=2\cos\theta-\cos 2\theta$, $\theta\in[0,2\pi]$, then $\frac{d^2y}{dx^2}$ at $\theta=\pi$ is:

(1) $\frac{3}{4}$
(2) $-\frac{3}{8}$
(3) $\frac{3}{2}$
(4) $-\frac{3}{4}$

10. If $x=e^t\sin t, y=e^t\cos t, t$ is a parameter, then $\frac{d^2y}{dx^2}$ at $(1,1)$ is equal to

(1) $-\frac{1}{2}$
(2) $-\frac{1}{4}$
(3) 0
(4) $\frac{1}{2}$