32. Select and write the correct option: $(isc\ Sem\ 1-2021)$

If $x = a\ \cos\theta\ ,\ y = a\ \sin\theta,$ then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{2}$ will be:

(a) $\frac{dy}{dx} = -1$

(b) $\frac{dy}{dx} = 1$

(c) $\frac{dy}{dx} = 0$

(d) $\frac{dy}{dx} = 2$

Answer: _____

Solution: (c)

$x = a\ \cos\theta \quad \Rightarrow \frac{dx}{d\theta} = -a\ \sin\theta$

$y = a\ \sin\theta \quad \Rightarrow \frac{dy}{d\theta} = a\ \cos\theta$

$\therefore \frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{a\ \cos\theta}{-a\ \sin\theta} = -\cot\theta$

$\therefore \left(\frac{dy}{dx}\right)_{\theta=\frac{\pi}{2}} = -\cot\frac{\pi}{2} = 0$

33. Select and write the correct option: $(isc\ Sem\ 1-2021)$

If $y = \tan^{-1}x$, then

(a) $(1+x^2)\frac{d^2y}{dx^2} + 2x\ \frac{dy}{dx} = 0$

(b) $\sqrt{1-x^2}\ \frac{d^2y}{dx^2} + 2x\ \frac{dy}{dx} = 0$

(c) $(1-x^2)\frac{d^2y}{dx^2} + 2x\ \frac{dy}{dx} = 0$

(d) $\sqrt{1+x^2}\ \frac{d^2y}{dx^2} + 2x\ \frac{dy}{dx} = 0$

Answer: _____

Solution: (a)

$y = \tan^{-1}x$ (Differentiating $w.r.t.x$)

$\Rightarrow \frac{dy}{dx} = \frac{1}{1+x^2} \Rightarrow (1+x^2)\frac{dy}{dx} = 1$

$\Rightarrow (1+x^2)\frac{d^2y}{dx^2} + 2x\ \frac{dy}{dx} = 0$ (Again differentiating $w.r.t.x$)