Ans To The Ques NO. 01

$$f(x) = \sqrt{x^3 + \operatorname{cosec}(x)}$$

$$= \frac{d}{dx}\left(\sqrt{x^3 + \operatorname{cosec}(x)}\right)$$

$$= \frac{d}{dx}\left[x^3 + \operatorname{cosec}(x)\right]^{1/2}$$

By using chain rule of differentiation,

$$= \frac{1}{2}\left[x^3 + \operatorname{cosec}(x)\right]^{\frac{1}{2}-1}\left[3x^2 - \operatorname{cosec}(x).\cot(x)\right]$$

$$= \frac{1}{2}\left[x^3 + \operatorname{cosec}(x)\right]^{-\frac{1}{2}}\left[3x^2 - \operatorname{cosec}(x)\cot(x)\right]$$

$$= \frac{3x^2 - \cot(x).\operatorname{cosec}(x)}{2\sqrt{x^3 + \operatorname{cosec}(x)}}$$

(Ans)

Ans To The Ques No. 02

$$f(x) = \frac{x}{x^2-2x}$$

$$u = x, \quad \frac{du}{dx} = 1$$

Let,

$$v = x^2 - 2x, \quad \frac{dv}{dx} = 2x-2$$

$$\frac{d}{dx}\left(\frac{x}{x^2-2x}\right) = \frac{d}{dx}\left(\frac{u}{v}\right)$$

$$= \frac{v \cdot \frac{d}{dx}(u) - u \cdot \frac{d}{dx} v}{v^2}$$

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

$$= \frac{x^2-2x-2x^2+2x}{(x^2)^2 - 2x^2(2x) + (2x)^2}$$

$$= \frac{x^2}{x^4-4x^3+4x^2}$$

(Ans)

Ans To The Ques No. 3

$f(x) = \sin\sqrt{1+\cos(x)}$

$= \frac{d}{dx}\left(\sin\sqrt{1+\cos(x)}\right)$

$= \cos\sqrt{1+\cos(x)} \cdot \frac{1}{2}(1+\cos(x))^{-1/2}(-\sin(x))$

$= \cos\sqrt{1+\cos(x)} \cdot \frac{1}{2}(1+\cos(x))^{-1/2}(-\sin(x))$

$= -\frac{\cos(\sqrt{1+\cos(x)}).\sin(x)}{2(1+\cos(x))^{1/2}}$

$= -\frac{\sin x\,(\cos\sqrt{1+\cos(x)})}{2\sqrt{1+\cos(x)}}$

(Ans)

Ans To The Ques No. 04

Given, $y^2 - x + 1 = 0$

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

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

$$2y \cdot \frac{dy}{dx} - 1 = 0$$

$$2y \cdot \frac{dy}{dx} = 1$$

$$\frac{dy}{dx} = \frac{1}{2y}$$

At the given points $(2, -1)$ slope of tangent line,

$$\frac{dy}{dx} = \frac{1}{2y} = \frac{1}{2(-1)} = -\frac{1}{2}$$

At the given points $(2, 1)$ slope of tangent line,

$$\frac{dy}{dx} = \frac{1}{2y} = \frac{1}{2(1)} = \frac{1}{2}$$