$$y' = \frac{3x^2 - 2x - \sin(2x)}{x^3 - x^2 + \cos^2 x} \qquad \left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}$$

$$u = 3x^2 - 2x - \sin(2x)$$

$$u' = 6x - 2 - \cos(2x) \cdot 2$$

$$v = x^3 - x^2 + \cos^2 x$$

$$v' = 3x^2 - 2x - \sin(2x)$$

$$y' = \frac{[6x - 2 - 2\cos(2x)][x^3 - x^2 + \cos^2 x] - [3x^2 - 2x - \sin(2x)]^2}{[x^3 - x^2 + \cos^2 x]^2}$$

$$y'\left(\frac{\pi}{2}\right) = \frac{\left[6\frac{\pi}{2} - 2 - 2\cos\left(2\frac{\pi}{2}\right)\right]\left[\left(\frac{\pi}{2}\right)^3 - \left(\frac{\pi}{2}\right)^2 + \cos^2\left(\frac{\pi}{2}\right)\right] - \left[3\left(\frac{\pi}{2}\right)^2 - 2\left(\frac{\pi}{2}\right) - \sin(\pi)\right]^2}{\left[\left(\frac{\pi}{2}\right)^3 - \left(\frac{\pi}{2}\right)^2 + \cos^2\left(\frac{\pi}{2}\right)\right]^2}$$

$$y'\left(\frac{\pi}{2}\right) = \frac{[3\pi - 2 - 2\cdot(-1)]\left[\frac{\pi^3}{8} - \frac{\pi^2}{4} + 0\right] - \left[\frac{3}{2}\pi^2 - \pi - 0\right]^2}{\left[\frac{\pi^3}{8} - \frac{\pi^2}{4} + 0\right]^2}$$

$$y'\left(\frac{\pi}{2}\right) = \frac{3\pi \cdot \left(\frac{\pi^3}{8} - \frac{\pi^2}{4}\right) - \left(\frac{3}{2}\pi^2 - \pi\right)^2}{\left(\frac{\pi^3}{8} - \frac{\pi^2}{4}\right)^2}$$

$$y'\left(\frac{\pi}{2}\right) = \frac{-12\pi^2 + 48\pi - 64}{\pi^4 - 4\pi^3 + 4\pi^2}$$