

Total time: 15 minutes.

Problem 1 (2 points each). Calculate derivatives.

1. $(\sin(x^2 + \sin x))' = \cos(x^2 + \sin x) \cdot (2x + \cos x)$

2. $(\cos((x^2 - 1)^{100}))' = -\sin((x^2 - 1)^{100}) \cdot 100(x^2 - 1)^{99} \cdot 2x$

3. $(2x^2 + \frac{\sin(x^3)}{x^2-1})' = 4x + \frac{\cos(x^3) \cdot 3x^2 \cdot (x^2-1) - \sin(x^3) \cdot 2x}{(x^2-1)^2}$

Problem 2 (4 points). Find $\frac{dy}{dx}$ for the implicit function $y(x)$ determined by

$$x^2y + \sin y = \cos x$$

Take $\frac{d}{dx}$,

$$2xy + x^2 \frac{dy}{dx} + \cos y \cdot \frac{dy}{dx} = -\sin x$$

$$(x^2 + \cos y) \cdot \frac{dy}{dx} = -\sin x - 2xy$$

$$\frac{dy}{dx} = \frac{-\sin x - 2xy}{x^2 + \cos y}$$