

Quiz 5 L. 13-15

Solutions

Problem 1

Find $f''(x)$

$$\frac{d[\ln(u)]}{dx} = \frac{u'}{u}$$

$$f(x) = 2x \ln(3x)$$

$$f'(x) = 2x \cdot \frac{3}{3x} + 2 \ln(3x) \quad (\text{product rule})$$
$$= 2 + 2 \ln(3x)$$

$$f''(x) = 2 \cdot \frac{3}{3x} = \boxed{\frac{2}{x}}$$

Problem 2

$$x^2 + xy = 4$$

Find $\frac{dy}{dx}$ at $(1, 0)$

$$\frac{d}{dx} [x^2 + xy] = \frac{d}{dx} [4]$$

(product rule)

$$2x + y + x \frac{dy}{dx} = 0$$

$$2(1) + 0 + (1) \frac{dy}{dx} = 0$$

$$\Rightarrow \frac{dy}{dx} = \boxed{-2}$$

Problem 3

The radius of a circle is increasing at the rate of 2 cm/min. Find the rate of change of the area of the circle when $r = 4$ cm

$$A = \pi r^2$$

$$\frac{dA}{dt} = 2\pi r \frac{dr}{dt} = 2\pi (4 \text{ cm}) (2 \text{ cm/min})$$
$$= \boxed{16\pi \text{ cm}^2/\text{min}}$$