

#1

$$f(x) = x^3 \cos x$$

$$f'(x) = -x^3 \sin x + 3x^2 \cos x$$

#2

$$f(x) = \tan^2(\cos x)$$

$$f'(x) = 2 \tan(\cos x) \sec^2(\cos x) \cos x$$

#3

$$f(x) = (x^3 + 4x)^7$$

$$f'(x) = 7(x^3 + 4x)^6 (3x^2 + 4)$$

#4

$$f(x) = (1 + 4x)^5 (3 + x - x^2)^8$$

$$f'(x) = (1 + 4x)^5 \cdot 8(3 + x - x^2)^7 (1 - 2x) + 5(1 + 4x)^4 \cdot 4(3 + x - x^2)^8$$

#6

$$f(x) = x \sin \sqrt{x}$$

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

#5

$$f(x) = \frac{x}{\sqrt{7-3x}} = \frac{x}{(7-3x)^{1/2}}$$

$$f'(x) = \frac{(7-3x)^{1/2} - x^{1/2} (7-3x)^{-1/2} (-3)}{7-3x}$$

#7

$$x^2 y^2 + x \sin y = 4$$

$$x^2 2y y' + 2xy^2 + x \cos y y' + \sin y = 0$$

$$(2x^2 y + x \cos y) y' = - (2xy^2 + \sin y)$$

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

#8

$$y = (x^3 + 1)^{2/3}$$

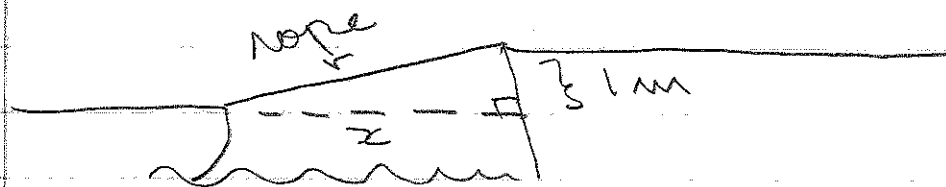
$$y' = \frac{2}{3} (x^3 + 1)^{-1/3} 3x^2$$

$$= 2x^2 (x^3 + 1)^{-1/3}$$

$$y'' = 2x^2 \left(-\frac{1}{3}\right) (x^3 + 1)^{-4/3} 3x^2$$

$$+ 4x (x^3 + 1)^{-1/3}$$

#9

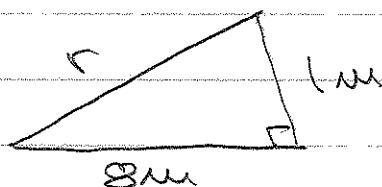


$$\frac{ds}{dt} = -1 \text{ m/s} \quad \frac{dx}{dt} = ?$$

$$r^2 = x^2 + (1 \text{ m})^2$$
$$2r \frac{dr}{dt} = 2x \frac{dx}{dt}$$

$$\frac{dx}{dt} = \frac{r}{x} \frac{ds}{dt}$$

when $x = 8 \text{ m}$



$$r^2 = (8 \text{ m})^2 + (1 \text{ m})^2$$

$$r = \sqrt{65} \text{ m}$$

$$\frac{dx}{dt} = \frac{\sqrt{65} \text{ m}}{8 \text{ m}} (-1 \text{ m/s})$$

$$= -\frac{\sqrt{65}}{8} \text{ m/s}$$

$$\approx -1.0078 \text{ m/s}$$