

$$\begin{aligned}
 \text{c) } & \frac{d}{dx} (1 - x + y - xy) \\
 &= -1 + \frac{dy}{dx} - (x) \left(\frac{dy}{dx} \right) - (y)(1) \\
 &= \underline{-1 + \frac{dy}{dx} - x \frac{dy}{dx} - y}
 \end{aligned}$$

$$\begin{aligned}
 \text{e) } & \frac{d}{dx} (x^3y + y^3x) \\
 &= (x^3) \left(\frac{dy}{dx} \right) + (y)(3x^2) + (y^3)(1) + (x) \left(3y^2 \frac{dy}{dx} \right) \\
 &= \underline{x^3 \frac{dy}{dx} + 3x^2y + y^3 + 3xy^2 \frac{dy}{dx}}
 \end{aligned}$$

$$i) \quad \frac{d}{dx} [(x+y)^3] = 3(x+y)^2 \left(1 + \frac{dy}{dx}\right)$$

$$\begin{aligned} ii) \quad \frac{d}{dx} (\sqrt{x+y}) &= \frac{d}{dx} \left\{ (x+y)^{\frac{1}{2}} \right\} \\ &= \frac{1}{2} (x+y)^{-\frac{1}{2}} \left(1 + \frac{dy}{dx}\right) \\ &= \frac{1 + \frac{dy}{dx}}{2\sqrt{x+y}} \end{aligned}$$

$$2f) \quad x^2 y^3 = 32$$

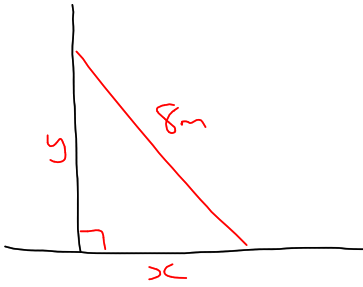
$$(x^2) \left(3y^2 \frac{dy}{dx} \right) + (y^3)(2x) = 0$$

$$3x^2 y^2 \frac{dy}{dx} = -2xy^3$$

$$\frac{dy}{dx} = \frac{-2xy^3}{3x^2 y^2}$$

$$= \underline{\underline{\frac{-2y}{3x}}}$$

7



$$x^2 + y^2 = 64$$
$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 0$$
$$x \frac{dx}{dt} + y \frac{dy}{dt} = 0$$

a) $\frac{dx}{dt} = \frac{1}{50} \text{ m/s}$, $x = 2 \text{ m}$
 $y = 2\sqrt{15} \text{ m}$
 $x \frac{dx}{dt} + y \frac{dy}{dt} = 0$

$$(2) \left(\frac{1}{50}\right) + 2\sqrt{15} \frac{dy}{dt} = 0$$

$$2\sqrt{15} \frac{dy}{dt} = -\frac{1}{25}$$

$$\frac{dy}{dt} = -\frac{1}{50\sqrt{15}} \text{ m/s}$$

$$b) \frac{dx}{dt} = \frac{1}{500} \text{ m/s} \quad , \quad y=7\text{m}, \quad x=\sqrt{15}\text{m}$$

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

$$(\sqrt{15}) \left(\frac{1}{500} \right) + 7 \frac{dy}{dt} = 0$$

$$7 \frac{dy}{dt} = - \frac{\sqrt{15}}{500}$$

$$\frac{dy}{dt} = \frac{-\sqrt{15}}{3500} \text{ m/s}$$

8/ a)

$$S^3 = 36\pi V^2$$

$$S = 4\pi r^2$$

$$S^3 = 64\pi^3 r^6$$

$$V = \frac{4}{3}\pi r^3$$

$$V^2 = \frac{16}{9}\pi^2 r^6$$

$$36\pi V^2 = 64\pi^3 r^6$$

$$\therefore S^3 = 36\pi V^2$$

$$3S^2 \frac{dS}{dt} = 72\pi V \frac{dV}{dt}$$

$$b) \frac{ds}{dt} = 4 \text{ cm}^2/\text{s} \quad \frac{dV}{dt} = ?$$

$$3s^2 \frac{ds}{dt} = 72\pi V \frac{dV}{dt}$$
$$3(100\pi)^2(4) = 72\pi \left(\frac{500\pi}{3}\right) \frac{dV}{dt}$$

$$\frac{dV}{dt} = \frac{120000\pi^2}{12000\pi^2}$$
$$= \underline{10 \text{ cm}^3/\text{s}}$$

$$r = 5$$

$$S = 4\pi(5)^2$$
$$= 100\pi$$

$$V = \frac{4}{3}\pi(5)^3$$
$$= \frac{500\pi}{3}$$