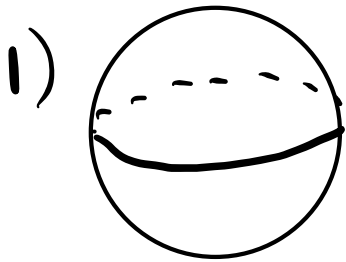


Homework 14



$$\frac{dV}{dt} = -324\pi \text{ mm}^3/\text{sec} \quad V = 972\pi \text{ mm}^3$$

$$\frac{dr}{dt} = ?$$

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

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$$

$$-324\pi = 4\pi \cdot 9^2 \frac{dr}{dt}$$

$$-324 = 324 \frac{dr}{dt}$$

$$\frac{dr}{dt} = -1 \text{ mm/s}$$

$$972\pi = \frac{4}{3}\pi r^3$$

$$r^3 = 729$$

$$r = 9 \text{ mm}$$

2)

$$\frac{dx}{dt} = 120$$

$$\frac{dh}{dt} = ?$$

$$x^2 + y^^2 = h^2$$

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2h \frac{dh}{dt}$$

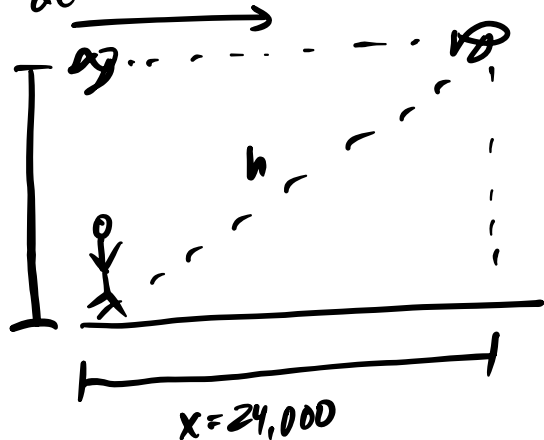
$$24000 \cdot 120 = 40,000 \frac{dh}{dt}$$

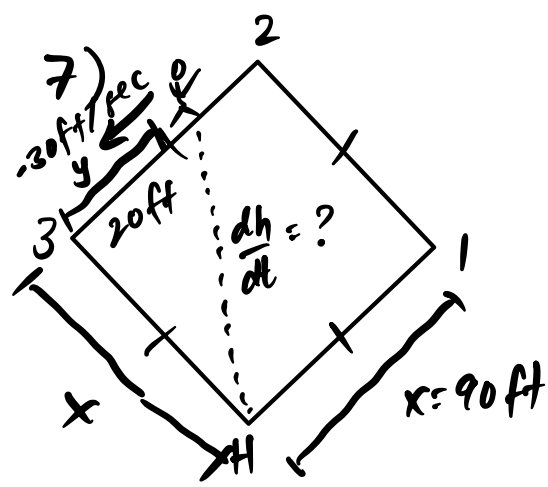
$$\frac{dh}{dt} = 72$$

$$x^2 + y^2 = h^2$$

$$24000^2 + 32,000^2 = h^2$$

$$h = 40,000$$





$$x^2 + y^2 = h^2$$

$$2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2h \frac{dh}{dt}$$

$$20 \frac{dy}{dt} = \sqrt{8500} \frac{dh}{dt}$$

$$20 \cdot -30 = \sqrt{8500} \frac{dh}{dt}$$

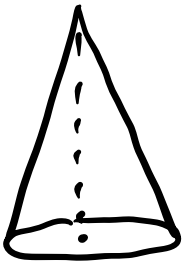
$$\frac{dh}{dt} = \frac{-600}{\sqrt{8500}} \text{ ft/sec}$$

$$x^2 + y^2 = h^2$$

$$90^2 + 20^2 = h^2$$

$$h = \sqrt{8500}$$

8)



$$h = d$$

$$h = 10$$

$$\frac{dh}{dt} = 5 \text{ ft/min}$$

$$\frac{dV}{dt} = ?$$

$$V = \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \pi \left(\frac{h}{2}\right)^2 h$$

$$V = \frac{1}{3} \pi \frac{h^2}{4} \cdot h$$

$$V = \frac{1}{12} \pi h^3$$

$$\frac{dV}{dt} = \frac{\pi}{12} \cdot 3h^2 \frac{dh}{dt}$$

$$\frac{dV}{dt} = \frac{\pi}{4} \cdot 100 \cdot 5$$

$$\frac{dV}{dt} = 125\pi \text{ ft}^3/\text{min}$$

$$h = d$$

$$d = 2r$$

$$h = 2r$$

$$r = \frac{h}{2}$$

Homework 15

$$1) y = -\frac{5}{(x+3)^2}$$

$$dy = f'(x) dx$$
$$dy = \frac{10}{(x+3)^3} dx$$

$$f(x) = -5(x+3)^{-2}$$

$$f'(x) = 10(x+3)^{-3}$$

$$= \frac{10}{(x+3)^3}$$

$$4) y = 5x^3 \quad [-2, 1]$$

$$\Delta y = f(1) - f(-2)$$

$$\Delta y = 5 + 40$$

$$= 45$$

$$7) f(x) = \sqrt{x+3} \quad @ a = 22$$

$$\sqrt{24.9}$$

$$\sqrt{25.01}$$

$$L(x) \approx f(a) + f'(a)(x-a)$$

$$f(22) = 5$$

$$L(x) \approx 5 + \frac{1}{10}(x-22)$$

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

$$f'(22) = \frac{1}{2}(25)^{-\frac{1}{2}}$$

$$= \frac{1}{2} \cdot 5^{-1}$$

$$= \frac{1}{10}$$

$$\sqrt{24.9} = \sqrt{x+3}$$

$$24.9 = x+3$$

$$x = 21.9$$

$$L(21.9) = 5 + \frac{1}{10}(21.9-22)$$

$$= 5 + \frac{1}{10}(-0.1)$$

$$= 5 - 0.01 = 4.99$$

$$\sqrt{25.01} = \sqrt{x+3}$$

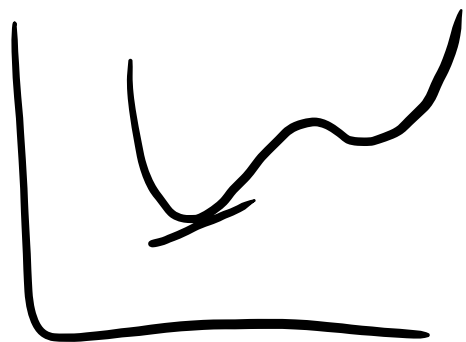
$$25.01 = x+3$$

$$x = 22.01$$

$$L(22.01) = 5 + \frac{1}{10}(22.01-22)$$

$$= 5 + \frac{1}{10}(.01)$$

$$= 5 + .001 = 5.001$$



$$9) e^{0.2} \quad f(x) = e^x \quad a = 0$$

$$L(x) \approx f(a) + f'(a)(x-a)$$

$$L(x) \approx 1 + 1(x-0) = 1+x$$

$$f(0) = 1$$

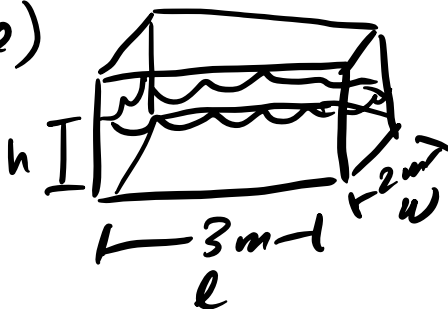
$$f'(x) = e^x$$

$$f'(0) = 1$$

$$L(0.2) \approx 1 + 0.2 = 1.2$$

Homework 14

b)



$$\frac{dV}{dt} = 0.3 \text{ m}^3/\text{min}$$

$$\frac{dh}{dt} = ?$$

$$V = lwh$$

$$V = lh$$

$$\frac{dV}{dt} = l \frac{dh}{dt}$$

$$0.3 = 6 \cdot \frac{dh}{dt}$$

$$\frac{dh}{dt} = 0.05 \text{ m/sec}$$