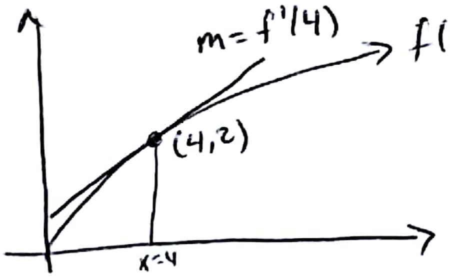
6.7) (a)



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

$m=f'(4) = \frac{1}{2}(4)^{-1/2} = \frac{1}{2}\cdot\frac{1}{\sqrt{4}} = \frac{1}{4}$

tangent line : $y-y_1 = m(x-x_1)$

$y-2 = \frac{1}{4}(x-4)$

approximation of $f(4.4)=\sqrt{4.4}$:

$y-2 = \frac{1}{4}(4.4-4)$

$y = \frac{1}{4}(0.4)+2 = 2.1$

$\boxed{f(4.4)=\sqrt{4.4} \approx 2.1}$

(b) percent error $= \dfrac{\text{error}}{\text{actual}}\cdot 100$

error $= 2.1-\sqrt{4.4}$

actual $= \sqrt{4.4}$

percent error $= \dfrac{2.1-\sqrt{4.4}}{\sqrt{4.4}}\cdot 100$

$\approx 0.11357\%$

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9.36) (a) $11 → 25,000

$10 → 32,000

↑ ↑

$p(x)$ x

$$m = \frac{P(x)_2 - P(x)_1}{x_2 - x_1} = \frac{10-11}{32{,}000 - 25{,}000} = -\frac{1}{7000}$$

$$y - y_1 = m(x - x_1)$$

$$P(x) - 11 = -\frac{1}{7000}(x - 25{,}000)$$

$$\boxed{P(x) = -\frac{1}{7000}(x - 25{,}000) + 11}$$

(b) $R = xp(x)$

$$= x\left(-\frac{1}{7000}(x - 25{,}000) + 11\right)$$

$$= -\frac{x}{7000}(x - 25{,}000) + 11x$$

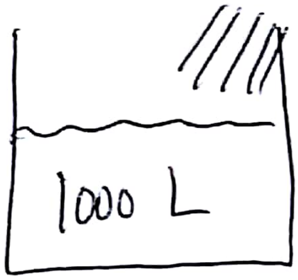
$$= -\frac{1}{7000}x^2 + \frac{25{,}000}{7000}x + 11x$$

$$R' = -\frac{2}{7000}x + \frac{25000}{7000} + 11 = 0$$

$$x = \frac{-11 - \frac{25000}{7000}}{-\frac{2}{7000}} = \left(11 + \frac{25000}{7000}\right)\left(\frac{7000}{2}\right)$$

Now, we can find the correct prize by finding $p(x)$.

5.37) (a)



30 L/hr

5 mg/L $\longrightarrow$ 5·30 mg/hr

$$C(t) = \frac{\text{Detergent}}{\text{Solution}} = \frac{150t}{1000+30t}$$

$$C(t) = 2 = \frac{150t}{1000+30t}$$

$$\Rightarrow 2(1000+30t) = 150t$$

$$90t = 2000$$

$$\boxed{t = \frac{200}{9} \text{ hrs.}}$$

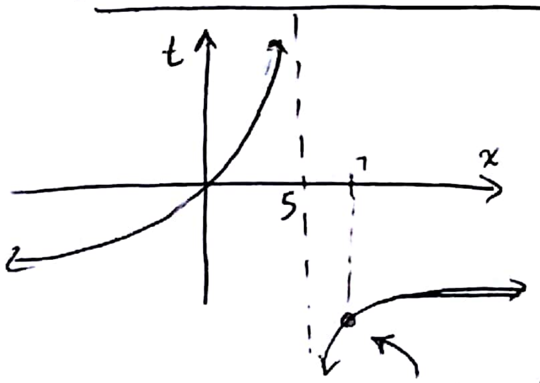
(b) insted of 2, we want x.

$$\frac{150t}{1000+30t} = x \Rightarrow 150t = x(1000+30t)$$

$$150t - 30xt = 1000x$$

$$\boxed{t = \frac{1000x}{150-30x} \text{ hrs}}$$

(c)

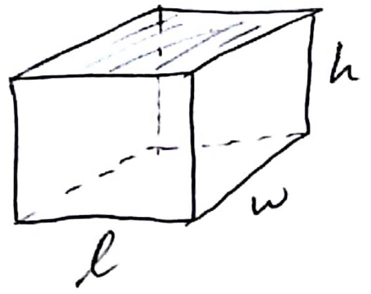


You don't have to know how to find this. You could graph with a calculator.

(d) $x=7$ gives $t = \frac{1000(7)}{150-30(7)} \approx -116.67$.

why is t negative?! Because the concentration can never be 7! why?

8.19)



know: $V = 10 = lwh$

$l = 2w$

Want to minimize cost $\Rightarrow$ need to find cost

C = cost of base + cost of each side

$= lw(9) + lh(9.6) + lh(9.6) + wh(9.6) + wh(9.6)$

$= lw(9) + 2l\cancel{h}(9.6) + 2wh(9.6)$

Can't take derivative with three variables :(

use $l = 2w$ and $10 = lwh = 2w^2h \Rightarrow h = \frac{10}{2w^2} = \frac{5}{w^2}$

Now,

$C = 2w^2(9) + 4w\left(\frac{5}{w^2}\right)(9.6) + 2w\left(\frac{5}{w^2}\right)(9.6)$

$= 18w^2 + 20(9.6)w^{-1} + 10(9.6)w^{-1} = 18w^2 + 30(9.6)w^{-1}$

Now we can take a derivative and set it equal to 0.

$C' = 36w - 30(9.6)w^{-2}$

$= 36w - \frac{30(9.6)}{w^2} = 0$

$\Rightarrow 36w = \frac{30(9.6)}{w^2} \Rightarrow w^3 = \frac{30(9.6)}{36} = \frac{5(9.6)}{6}$

$w = \sqrt[3]{\frac{5(9.6)}{6}}$.

Now that we have w, we can figure out what $l, h,$ and C are as well.