

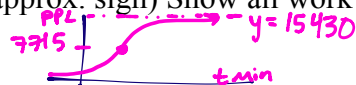
# KEY

1. The number of people at people infected with the insatiable thirst for math after  $t$  minutes is modeled by the function

(Calculator)

$$W(t) = \frac{15430}{1 + 182e^{-0.34t}}$$

For each of the following give the three decimal approximation then round to the nearest person or minute. (use approx. sign) Show all work that leads to your answer.



graphing window

$$\begin{aligned} X_{\min} &= -1 \\ X_{\max} &= 35 \\ X_{\text{sc1}} &= 0 \\ Y_{\min} &= -1 \\ Y_{\max} &= 18000 \\ Y_{\text{sc1}} &= 0 \end{aligned}$$

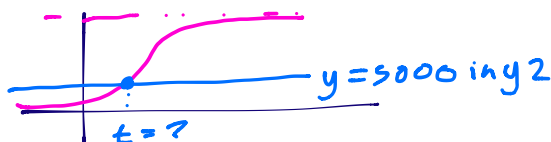
- (a) What was the initial number of people infected?

$$W(0) = 118.199 \approx 118 \text{ ppl} \quad (\checkmark) \quad (\checkmark 2)$$

- (b) After how many minutes will the number of infected people be 5000?

$$\checkmark W(t) = 5000$$

$$t = 13.143 \approx 13 \text{ min}$$

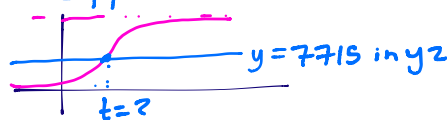


- (c) After how many minutes is the infection be spreading the fastest rate?

At inflection point, at  $y = 15430 \div 2 = 7715 \text{ ppl}$

$$W(t) = 7715$$

$$\checkmark t = 15.305 \approx 15 \text{ min} \quad (\checkmark)$$



- (d) How many people are infected after an hour and a half?

$$1 \text{ hr \& half} = 60 + 30 = 90 \text{ min}$$

$$W(90) = 15429.999 \text{ ppl} \approx 15430 \text{ ppl} \quad (\checkmark)$$

- (e) According the model, what is the population of people?

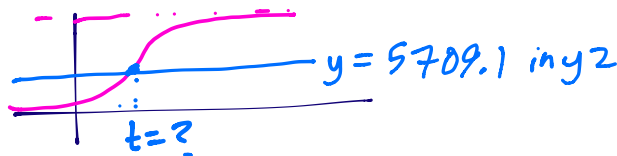
Since  $\lim_{t \rightarrow \infty} W(t) = 15430$ , the model suggests

the population is 15430 people  $(\checkmark)$

- (f) After how many minutes will the number of infected people reach 37% of the total population?

$$(0.37)(15430) = 5709.1 \text{ in y2}$$

$$W(t) = 5709.1 \quad (\checkmark)$$



$$t = 13.740 \approx 14 \text{ min} \quad (\checkmark)$$

Note:  $W(t) = 5709$  gives  $t = 13.740 \approx 14 \text{ min also!}$

2. For  $f(x) = \frac{7}{5} + \frac{3}{4}(.003)^{\left(\frac{5}{4} - 4x\right)}$   
 (No Calculator)

(a) Write  $f(x)$  in standard transformation form and describe the transformations.

$$f(x) = \frac{3}{4}(.003)^{\left(-4\left(x - \frac{5}{16}\right)\right)} + \frac{7}{5}$$

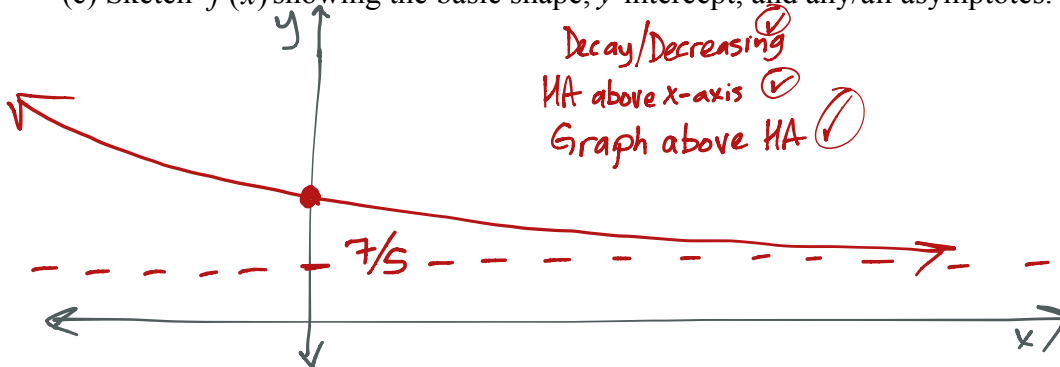
(b) Find the **simplified, exact value** of the y-intercept. Show the work that leads to your answer.

using original equation (easier)

$$f(0) = \frac{7}{5} + \frac{3}{4}(.003)^{5/4} > 0 \text{ (positive)}$$

Simplified exact answer!

(c) Sketch  $f(x)$  showing the basic shape, y-intercept, and any/all asymptotes.



(d) Find  $D_f$ :  $\{x | x \in \mathbb{R}\}$  or  $\mathbb{R}$  or  $(-\infty, \infty)$

(e) Find  $R_f$ :  $\{y | y > \frac{7}{5}\}$  or  $(\frac{7}{5}, \infty)$

(f) Find the **Equation(s)** of any/all asymptotes. Be sure to label which type they are.

HA @  $y = \frac{7}{5}$

Bonus

(g)  $\lim_{x \rightarrow \infty} f(x) = \frac{7}{5}$

(h)  $\lim_{x \rightarrow -\infty} f(x) = \infty$