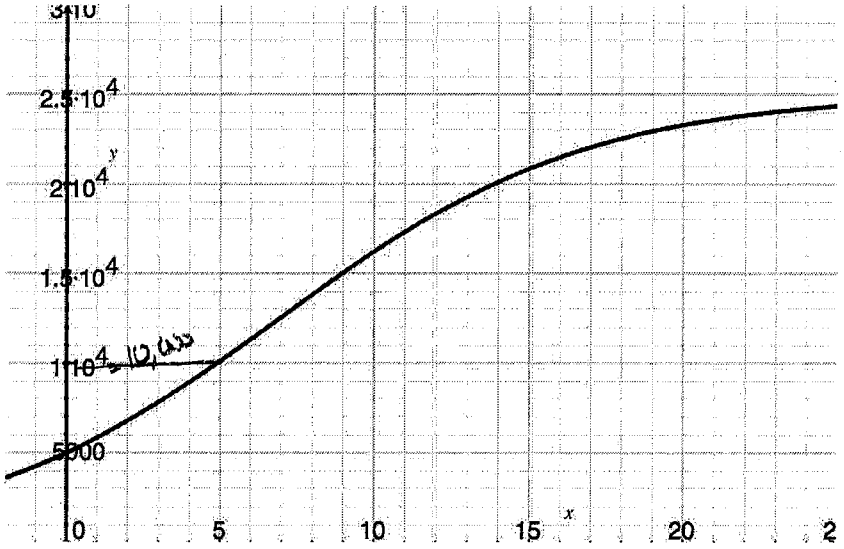
Quiz 3 Key

This is a two-stage quiz. During the first stage, you have 15 minutes to use your knowledge & calculator to take this quiz. In the second stage, you are welcome to use your books, notes, and students in the class to retake the same quiz. You have 15 min. to complete the quiz and to build one solution to be turned in.

Show *all* your work. Reasonable supporting work must be shown for any partial credit.

1. The number of people in a community who became infected during an epidemic x weeks after its outbreak is modeled by the function $f(x) = \dfrac{25,000}{1+4e^{kx}}$ for some parameter k. This is graphed to the right.



(a) [1] Give a realistic domain for f.

$[0, 50)$ (+1) probably not ∞ but 50 could work

(b) [1] Estimate the number of initial people infected.

at $x=0$ (+.5)

$\dfrac{25,000}{1+4e^{k0}} = \dfrac{25000}{1+4\cdot1} = \dfrac{25000}{5} = 5000$ (+.5)

(c) [2] Estimate how many weeks until there are 10,000 people infected.

≈ 5 weeks (looking at graph when $y = 10{,}000$) (+1)

(d) [4] Find the parameter k so we have the complete algebraic rule of f.

use $(5, 10{,}000)$ (+.5)

plug in (+.5) $10{,}000 = \dfrac{25000}{1+4e^{5k}}$

$(1+4e^{5k})\cdot 10{,}000 = 25{,}000$

$1+4e^{5k} = 2.5$ (+1 alg)

$4e^{5k} = 1.5$ (+1 alg)

$e^{5k} = \dfrac{1.5}{4}$ use log (+.5)

$5k = \ln\left(\dfrac{1.5}{4}\right)$ (+.5 alg)

$k = \dfrac{\ln\left(\frac{1.5}{4}\right)}{5} \approx -.196$

2. [2] Solve for x given $(x+1)^{\frac{1}{2}} + 3 = x$

$\sqrt{x+1} + 3 = x$

correct (+.5) $-3 \quad -3$

$\sqrt{x+1} = x-3$ (+.5) square both sides

$x+1 = (x-3)^2$

$x+1 = x^2 - 6x + 9$ (+1)

$-x-1 \quad -x \quad -1$

$0 = x^2 - 7x + 8$

- Desmos
- Factor
- Quad Formula $\dfrac{7 \pm \sqrt{49-4(1)(8)}}{2(1)}$ so 5.56 or 1.438
- Complete the $\square$