Unit 9: Solving Problems involving log and exp functions

Solve:

$$\log_2 x + 9\log_x 2 = 6$$

use laws to create logs w/ same bases

$$\frac{\log x}{\log 2} + 9\frac{\log 2}{\log x} = 6$$

$$\log_c m = \frac{\log_{10} m}{\log_{10} c}$$

$$\frac{\log^2 x + 9\log^2 2}{\log x \log 2} = \frac{6}{1}$$

$$\frac{5}{2} + \frac{2}{x} = 6$$

cross multiple 1 fraction on each side

$$\log^2 x + 9\log^2 2 = 6\log 2 \log x$$

$$\log x^2 \neq \log^2 x$$

$$(\log x)^2 = \log^2 x$$

$$x^2 + 3.5 - 7x = 0$$

let $y = \log x$

$$y^2 - 6\log 2\, y + 9\log^2 2 = 0$$

use quad formula

$a = 1$

$b = -6\log 2$

$c = 9\log^2 2$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-(-6\log 2) + \sqrt{(-6\log 2)^2 - 4(9(\log^2 2))}}{2}$$

$(\log 2)^2$

$$y = 0.903$$

or

$$y = \frac{6\log 2 - \sqrt{(6\log 2)^2 - 49(\log 2)^2}}{2}$$

$y = 0.903$

sub y into $y = \log x$

$0.903 = \log_{10} x$ solve.

$10^{0.903} = x$ $\quad x = 7.998$

Solve

$$\ln 3x^2 + \ln 3x - \ln x = 3$$

$$\ln 3x^2 \cdot 3x - \ln x = 3$$

$$\ln 9x^3 - \ln x = 3$$

$$\ln \frac{9x^3}{x} = 3$$

$$\ln_e 9x^2 = 3$$

$$9x^2 = e^3$$

$$\sqrt{x^2} = \sqrt{\frac{e^3}{9}}$$

$$x = \sqrt{\left(\frac{e^3}{9}\right)}$$

$$x = 1.49$$

Note Bene

$$\ln x = \log_e x$$

$e^1 = 2.718281828\ldots$

$$y = a^x \longrightarrow \log_a y = x$$

$x =$

$$3^x = 2$$

Pg 9.20

Sketch / Label axis

w

$= \log 3(x + \frac{2}{3})$

$w(x) = \log(3x + 2)$

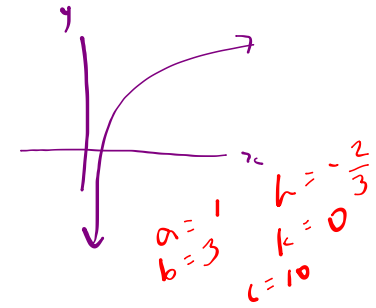
$w(x) = a\log b(x-h) + k$

z

$z(x) = \log 30 - \log(x+1)$

$z(x) = -\log(x+1) + \log 30$

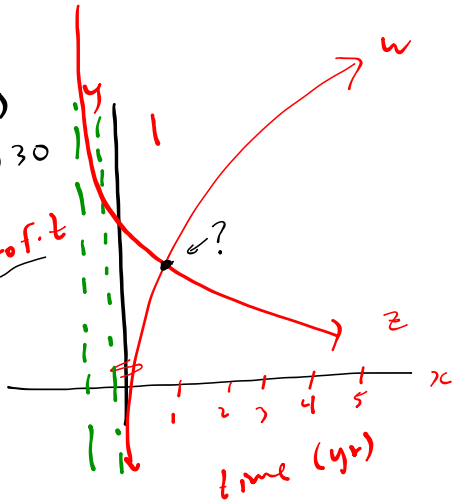
$z(x) = a\log b(x-h) + k$



$a = -1$ $h = -1$

$b = 1$ $k = \log 30 = 1.477$

$c = 10$



proof.t

?

When do the make the same profit?

- comparison
- substitution
- elimination

Solve for x: bring x's together and isolate

Substitution: put $w(x) = z(x)$

$\log(3x+2) = -\log(x+1) + \log 30$

$\log(3x+2) = -\log(x+1) + 1.477$

$x = -5 + \sqrt{11}$

$x = -1.68$

P 9.4 a white blood cell divides into 4 every hr.

$A(t) = a c^{kt}$

$A(t) = 1 \cdot 4^{1t}$

$A(t) = 4^{t}$

$2\,000\,000 = 4^{t}$

solve for t: $t =$

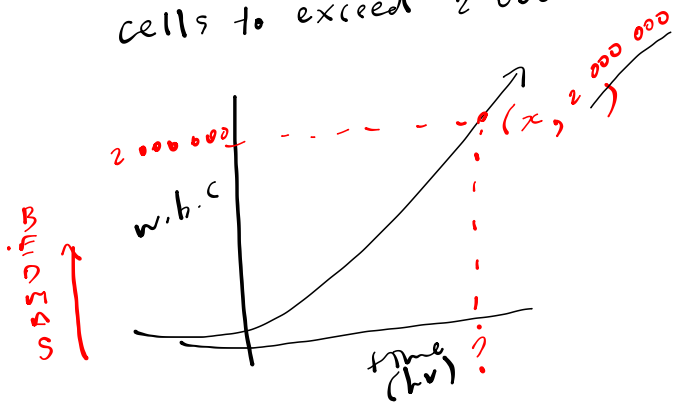
convert! (when exp # is isolated)

$\log_4 2\,000\,000 = t$

$t = \dfrac{\log 2\,000\,000}{\log 4}$

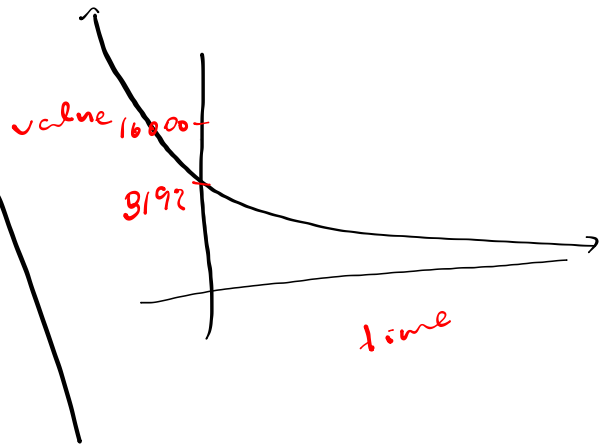
$t = 10.46$ hrs

How many hours will take for the bloods cells to exceed 2 000 000?



law 8 $\log_c m = \dfrac{\log m}{\log c}$

9.12
#6



p 9.5
#3 a/b/c

y is a function of x
y is dependant on x