Quiz 3

Key

Show *all* your work. Reasonable supporting work must be shown to earn credit. There are *two* sides to this quiz.

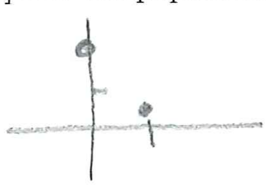
1. [3] (ExponentActivity pg2) Simplify: ${\frac{-1}{9}}^2 x^2y^3(3x^3)^2$

dist square (+.5)
order of op $-\frac{1}{81}$ (+.5)
Combine x's (+1)
Combine integers (+.5)

$$-\frac{1}{9}\cdot\frac{1}{9}\cdot xx\,yyy\;3x^3\,3x^3$$
$$= -\frac{1}{81}\,xx\,yyy\;3xxx\cdot 3xxx$$
$$= \frac{-1}{\cancel{81}\,9}\,9x^8\,y^3$$
$$= \frac{-1}{9}x^8y^3$$

2. (WebHW8 #30) It is known that the population (P measured in thousands) of a bug is modeled well by $P(t) = \frac{16}{3+ae^{kt}}$ where a and k are determined locally in geographic regions. In this region measurements have confirmed that $P(0) = 2$ and $P(1) = \frac{1}{2}$.

   (a) [1] Are the population of bugs increasing or decreasing?



decreasing (+1)

   (b) [3] Find a and k so that you have a model of the bug's population for our local region.

$P(0) = 2$ (+.5)

$\Rightarrow \frac{16}{3+ae^{k(0)}} = 2$

$\Rightarrow \frac{16}{3+a} = 2$

$\Rightarrow 16 = 2(3+a)$

$\Rightarrow 8 = 3+a$

$\Rightarrow 5 = a$ (+.5)

So we have $P(t) = \frac{16}{3+5\cdot e^{kt}}$

$P(1) = \frac{1}{2}$ (+.5)

$\Rightarrow \frac{16}{3+5e^k} = \frac{1}{2}$

$\Rightarrow 16 = \frac{1}{2}(3+5e^k)$

$\Rightarrow 32 = 3+5e^k$

$\Rightarrow 29 = 5e^k$

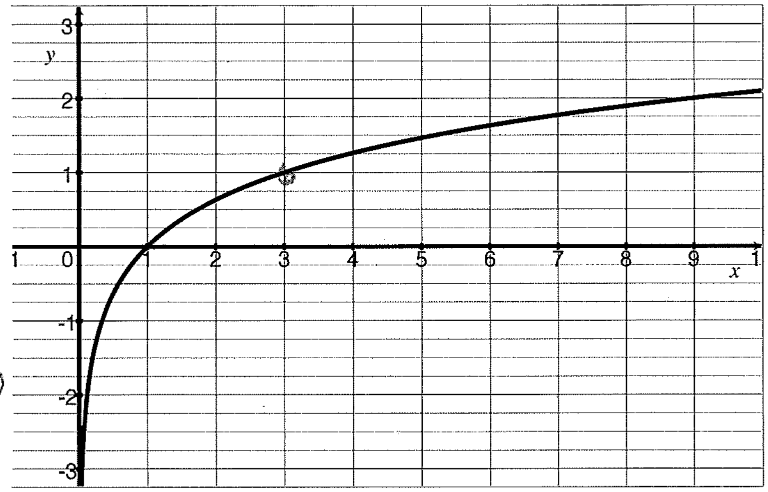
$\Rightarrow 29/5 = e^k$

$\Rightarrow \ln(29/5) = k$ ≈ 1.8

So $P(t) = \frac{16}{3+5e^{t(\ln\frac{29}{5})}}$

order of op (+1)
use ln/right (+.5)

3. The graph to the right is the graph of the form $f(x) = \log_b(x)$



(a) [1] (WebHW7 #20) What is the domain?

$(0, \infty)$

X values (.5)
got + (.5)

(b) [2] (§3.2 #72) Find b to write the explicit rule/expression for f.

thru $(1,0)$ $\Rightarrow$ $0 = \log_b(1)$ $\Rightarrow$ $b^0 = 1$

... doesn't tell me anything...

reading a point (.5)
plug in (.5)
found b (1)

thru $(3,1)$ $\Rightarrow$ $1 = \log_b(3)$ $\Rightarrow$ $b^1 = 3$

$\Rightarrow b = 3$

So $f(x) = \log_3(x)$