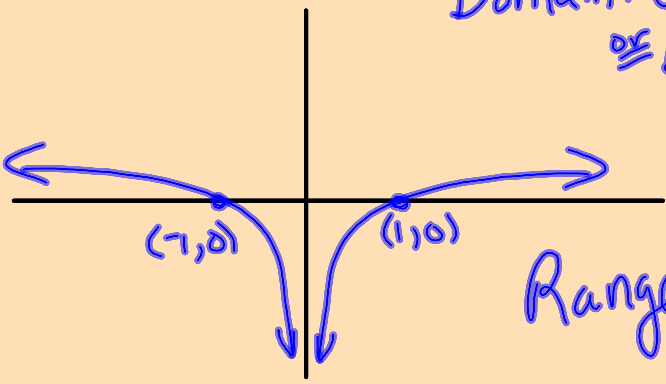
1. List the domain and range for the function $f(x) = \log_6 |x|$.

Domain: $\{x \in \mathbb{R} \mid x \neq 0\}$

or $(-\infty, 0) \cup (0, \infty)$



Range: $\mathbb{R}$

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2. Matching – Put the letter of the asymptote next to the function it corresponds to. You may use some asymptotes twice and some asymptotes may not be used at all.

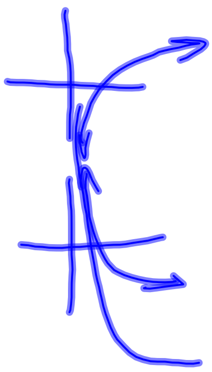
d) $f(x) = -8\log_2 x$

c) $f(x) = e^{(x-3)}$

d $f(x) = \log_3 x$

g) $f(x) = -e^x - 1$

b) $f(x) = \log(x+4)$



Asymptotes

~~a) $y = -4$~~

b) $x = -4$

~~c) $y = 0$~~

d) $x = 0$

~~e) $y = 3$~~

f) $x = 3$

~~g) $y = -1$~~

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3. During a four year span, the value of a home depreciated by 4% in the first year, by 7% in the second year, by 1% in the third year, and by 2% in the fourth year. What is the overall percent of depreciation of the house over the entire four year period? Round you answer to the nearest hundredth of a percent.

$$.98(.99(.93(.96(P))))$$

$$\boxed{.86619\,(P)}$$

$$.134 \rightarrow 13.4\%$$

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4. Recall that carbon 14 has a half life of 5,700 years. If a living thing dies, what percentage of its carbon 14 will remain after 1000 years?

$$A(t) = I e^{kt}$$

$$.5 = e^{5700k}$$

$$\ln(.5) = 5700k$$

$$\ln(.5)/5700 = k$$

A fossil is found that contains 70% of its original carbon 14. Approximately how old is the fossil?

$$A(1000) = 1.00\, e^{\ln .5/5700 \cdot 1000}$$

$$= e^\wedge(\ln(.5)/5700 \cdot 1000)$$

$$= .885$$

88.5%

$$.70 = 1.00\, e^{\ln(.5)/5700 \cdot t}$$

$$.70 = e^{.000122t}$$

$$\ln .70 = \cancel{\ln}(\cancel{e}^{-.000122t})$$

$$\ln(.70) = -.000122t$$

$$2933.07 = t$$

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5. Solve each equation.

a) $5^x = 4^{x+6}$

b) $\log(x+1)+\log(x-1)=\log 8$

$$\log 5^{x} = \log 4^{x+6}$$

$$x\log 5 = (x+6)\log 4$$

$$x\log 5 = x\log 4 + 6\log 4$$

$$x\log 5 - x\log 4 = 6\log 4$$

$$x(\log 5 - \log 4) = 6\log 4$$

$$x = \frac{6\log 4}{\log 5 - \log 4} = \frac{\log 4^{6}}{\log\left(\frac{5}{4}\right)} \approx 37.3$$

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6. Write the single logarithm as the sum or difference of multiple logarithms.

$$\ln\sqrt{\frac{x^3}{yz}} = \ln\left(\frac{x^3}{yz}\right)^{\frac{1}{2}}$$

$$= \frac{1}{2}\ln\left(\frac{x^3}{yz}\right)$$

$$= \frac{1}{2}\left[\ln(x^3) - \ln y - \ln z\right]$$

$$= \frac{1}{2}\left[3\ln(x) - \ln y - \ln z\right]$$

or $\frac{3}{2}\ln x - \frac{1}{2}\ln y - \frac{1}{2}\ln z$

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7. In the early stages of a measles epidemic there were 100 infected people and each day the number rose by 10%.
   a How many people were infected
      i after 2 days **ii** after a week?
   b How long would it take for 250 people to be infected?

$I(t) = 100(1.10)^t$

a) i $I(2) = 100(1.10)^2$
$= 121$

i $I(7) = 100(1.10)^7$
≈ 195 (3sf)

b) $250 = 100(1.10)^t$
$2.5 = (1.10)^t$

$\log_{1.10}(2.5) = \cancel{\log_{1.10}}\cancel{(1.10)}^t$

$9.61 = t$
(3sf)

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