Bellwork   Hon Alg 2   Friday, April 28, 2017

Solve each. Round to the nearest hundredth where necessary.

1. $5(2.4)^x + 1 = 73$
2. $\text{Log}_x(x + 12) = 2$

3. $7^{2x+3} - 8 = 100$

4. The population of a city is 750,000. The population has been decreasing 3.4% each year. In how many years, to the nearest hundredth, will the population reach 500,000?

1. $5(2.4)^x + 1 = 73$

$-1 \quad -1$

$5(2.4)^x = 72$

$\dfrac{5(2.4)^x}{5} = \dfrac{72}{5}$

$2.4^x = 14.4$

$\log_{2.4} 14.4 = x$

$x = \dfrac{\log 14.4}{\log 2.4}$

$\boxed{x = 3.05}$

2. $\text{Log}_x(x + 12) = 2$

$x^2 = x + 12$

$x^2 - x - 12 = 0$

$(x - 4)(x + 3) = 0$

$x = 4, -3$

$\boxed{x = 4}$

3. $7^{2x+3} - 8 = 100$

$\phantom{7^{2x+3}}+8 \quad +8$

$7^{2x+3} = 108$

$\log_7 108 = 2x + 3$

$\dfrac{\log 108}{\log 7} = 2x + 3$

$\boxed{x = -0.30}$

4. The population of a city is 750,000. The population has been decreasing 3.4% each year. In how many years, to the nearest hundredth, will the population reach 500,000?

$100 - 3.4 = 96.6\%$

$b = .966$

$\dfrac{500,000}{750,000} = \dfrac{750,000}{750,000}(.966)^x$

$\dfrac{2}{3} = .966^x \quad \rightarrow \quad \log_{.966}\left(\dfrac{2}{3}\right) = x$

$x = \dfrac{\log\left(\frac{2}{3}\right)}{\log(.966)} = \boxed{11.72}$