Precalculus

Practice With Exponential Growth & Decay

1. Determine whether each of the following represents an exponential growth function or exponential decay function, and find the constant percentage rate of growth or decay.

a. $P(t) = 3.5 \cdot 1.09^t$
growth / decay & r = 9%

b. $P(t) = 4.3 \cdot 1.018^t$
growth / decay & r = 1.8%

c. $f(x) = 78{,}963 \cdot 0.968^x$
growth / decay & r = 3.2%

d. $f(x) = 5607 \cdot 0.9968^x$
growth / decay & r = .32%

e. $g(t) = 247 \cdot 2^t$
growth / decay & r = 100%

f. $g(t) = 43 \cdot 0.05^t$
growth / decay & r = 95%

2. Determine the exponential function that satisfies the given conditions:

a. Initial value = 5, increasing at a rate of 1.7% per year $y = 5(1.017)^x$

b. Initial value = 52, decreasing at a rate of 2.3% per day $y = 52(.977)^x$

c. Initial mass = 0.6 g, doubling every 3 days $y = .6(2)^{x/3}$

d. Initial population = 250, halving every 7.5 hours $y = 250(\tfrac{1}{2})^{x/7.5}$

3. Find a logistic function of the form: $f(x) = \dfrac{c}{1 + a \bullet b^x}$ satisfying the following conditions: ***No Calculator***

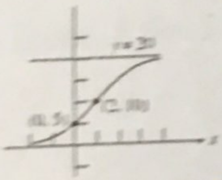
a. Initial value = 10
limit to growth = 40
passing through (1, 20)

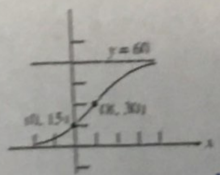
$y = \dfrac{40}{1+3(\tfrac{1}{3})^x}$

b. Initial value = 12
limit to growth = 60
passing through (1, 24)

$y = \dfrac{60}{1+4(\tfrac{3}{8})^x}$

4. Determine a formula for the logistic function of the form: $f(x) = \dfrac{c}{1 + a \bullet b^x}$ whose graph is shown in the figure below.





a. $y = \dfrac{20}{1+3\left(\sqrt{\tfrac{1}{3}}\right)^x}$

b. $y = \dfrac{60}{1+3\left(\sqrt[8]{\tfrac{1}{3}}\right)^x}$

5. The number of students infected with the swine flu at HSHS after t days is modeled by the function $f(t) = \dfrac{800}{1 + 49 \bullet e^{-0.2t}}$

a. How many students were sick when the outbreak started? 16

b. When will the number of infected students be 200? 13.516 days

c. What is the maximum number students that could be infected? 80

6. The number of stray cats in town t days after an accident involving a truck hauling raw fish, is modeled by $f(t) = \dfrac{308}{1 + 27 \bullet 0.79^t}$

a. How many stray cats were in town before the accident? 11

b. When will the number of stray cats be 200? 16.56 days

c. What is the maximum number of stray cats that could survive in town? 3

Suppose that an experimental population of fruit flies increases exponentially. The population began with 100, & after 2 days population reached 300 flies.

a. Write a model, $P(t)$, to represent the situation: ______

b. How many flies will be present in 10 days? ______

c. How long will it take for the population to reach a billion? ______