

October 19

GUIDED NOTES: Exponential Growth and Decay

EX1. Suppose 20^p rabbits are taken to an island. The rabbit population then triples^b every year. How many rabbits would there be after 2 years? t

$$a = p(b)^t$$

$$a: ?$$

$$p: 20$$

$$b: 3$$

$$t: 2$$

$$a = 20(3)^2$$

$$a = 180 \text{ rabbits}$$

EX2. The value of an iPad decreases at 35% per year. If the starting price of the iPad is $\$500^p$, how much will the iPad be worth after 5 years? t

$$a = p(b)^t$$

$$a: ?$$

$$p: 500$$

$$b: 100\% - 35\% = 65\% \div 100 = .65$$

$$t: 5$$

$$a = 500(.65)^5$$

$$a = \$58.01$$

When can you buy the iPad for \$5?

$$a = p(b)^t$$

$$a: 5$$

$$p: 500$$

$$b: .65$$

$$t: ?$$

$$\frac{5}{500} = \frac{500(.65)^t}{500}$$

$$.01 = .65^t$$

$$\ln .01 = \ln .65^t$$

$$\frac{\ln .01}{\ln .65} = \frac{t \cdot \ln .65}{\ln .65}$$

$$10.69 \text{ years} = t$$

EX3. The number of bacteria in a culture is doubling every hour. After 8 hours, there are 15,360 bacteria. How many were originally in the culture?

$$a = p(b)^t$$

$$a: 15360$$

$$p: ?$$

$$b: 2$$

$$t: 8$$

$$15360 = p \cdot (2)^8$$

$$\frac{15360}{256} = \frac{p \cdot 256}{256}$$

$$60 \text{ bacteria} = p$$

EX4. The city of Myerstopia was founded with 20 residents. The number of residents increases by 15% each year. How many residents will live in Myerstopia after 10 years?

$$a = p(b)^t$$

$$a: ?$$

$$p: 20$$

$$b: 100\% + 15\% = 115\% \div 100 = 1.15$$

$$t: 10$$

$$a = 20(1.15)^{10}$$

$$a = 81 \text{ residents}$$

How many years will pass before Myerstopia has 250 residents?

$$a = p(b)^t$$

$$a: 250$$

$$p: 20$$

$$b: 1.15$$

$$t: ?$$

$$\frac{250}{20} = \frac{20(1.15)^t}{20}$$

$$12.5 = 1.15^t$$

$$\ln 12.5 = \ln 1.15^t$$

$$\frac{\ln 12.5}{\ln 1.15} = \frac{t \cdot \ln 1.15}{\ln 1.15}$$

$$18.07 \text{ years} = t$$