

GUIDED NOTES: Exponential Functions

An exponential function is a function in the general form $A(t) = pb^t$

where b is positive $\³$ p is a constant

$p =$ principal amount $b =$ change $t =$ frequency (time)

Growth: $b > 1$

Decay: $0 < b < 1$

EX1. Suppose ^{p} two mice live in a barn. If the number of mice quadruples every 3 months, how many mice will be in the barn after 2 years?

$$2 \text{ years} = \frac{24 \text{ months}}{3 \text{ months}} = 8 \quad t$$

$$4 = b$$

$$A(8) = 2(4)^8$$

$$A(8) = \boxed{131,072 \text{ mice}}$$

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

$$1 - 0.35 = 0.65 \quad b$$

$$A(5) = 500(.65)^5 \quad P$$

$$A(5) = \boxed{\$58.01}$$

When can you buy the iPad for \$5?

$$A(t)$$

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

$$0.01 = .65^t$$

$$\ln 0.01 = \ln .65^t$$

$$\frac{\ln 0.01}{\ln .65} = t \frac{\ln .65}{\ln .65}$$

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

EX3. Suppose the acreage of forest is decreasing by 2% per year because of development. After 6 years of development, there is 4,000,000 acres of forest remaining. How many acres were originally in the forest? t

$$1 - 0.02 = 0.98 \quad b$$

$$4,000,000 = p(.98)^6 \quad P$$

$$\frac{4,000,000}{0.885...} = \frac{p(.98)^6}{0.885...}$$

$$p = \boxed{\$4,554,775.99 \text{ acres}}$$

EX4. Find a bank account balance to the nearest dollar, if the account starts with $\$100$, has an annual interest rate of 4% , and the money is left in the account for 12 years.

$$1. + .04 = 1.04$$

↑
b

$$A(t) = 100(1.04)^{12}$$

$$A(12) = 160.10 \rightarrow$$

$\$160$

If you wanted to buy a new gaming system for $\$250$, when will you have enough?

$$\frac{250}{100} = \frac{100(1.04)^t}{100}$$

$$2.5 = 1.04^t$$

$$\ln 2.5 = \ln 1.04^t$$

$$\frac{\ln 2.5}{\ln 1.04} = \frac{t \ln 1.04}{\ln 1.04}$$

$t = 23.36$ years

EX5. The pesticide DDT was widely used in the United States until its ban in 1972. If the half-life of DDT is 15 years for 100 grams, how much DDT would be remaining after 45 years?

$$b = .5$$

$$\frac{45 \text{ years}}{15 \text{ years}} = 3$$

t

$$y = 100 \left(\frac{1}{2}\right)^3$$

$y = 12.5$ grams