

# Exponential Growth & Decay Notes

 Lesson 1

Exponential functions are functions that have a variable (x) in the exponent.

Standard form for exponential functions :  $y = ab^x$

a = \_\_\_\_\_

b = \_\_\_\_\_

If  $b > 1$ , \_\_\_\_\_

If  $0 < b < 1$ , \_\_\_\_\_

**Example 1** . . . Without graphing, determine whether each function represents exponential growth or decay. Also determine the percent increase or decrease.

a.  $y = 100(0.12)^x$

b.  $y = 0.2(1.74)^x$

c.  $y = 16(3.4)^x$

d.  $f(x) = 32\left(\frac{14}{10}\right)^x$

**Example 2** . . . A new car that sells for \$18,000 depreciates 25% each year. Write a function that models the value of the car. Find the value of the car after 4 years.

**Example 3** . . . An abandoned house has a mouse population of 22. It is increasing at a rate of 5% per month. Write a function that models the population. Estimate when there will be 50 mice in the house.



- b) Arsenic-74 is used to locate brain tumors. It has a half-life of 17.5 days. Write an exponential decay function for a 90-mg sample. Use the function to find the amount remaining after 6 days.

### Compounded Interest!

When you put money in an investment account, or even just a bank, it collects interest. This means that the bank will give you a small amount of money just for letting your money sit in their bank. Interest is “compounded”, or calculated, a certain number of times per year.

**Example 3...** You invest \$100 at an annual interest rate of 4%, compounded *quarterly*. How much money will you have in the account after 25 years?

Continuously compounded interest is what it sounds like – there are not a certain number of times the interest is calculated – it’s done continuously, or all the time. There’s a separate formula for that situation:

### **Example 3...**

- a) You invest \$1050 at an annual interest rate of 5.5% compounded continuously. How much money will you have in the account after ten years?
- b) A student wants to save \$8000 for college in five years. How much should be put into an account that earns 5.2% annual interest compounded continuously?