Key

7.2 Day 1 Notes
Writing Exponential Functions
$y = ab^x$

- Parent function: $y = b^x$ will always intercept the y axis at (0,1).
- If a vertical stretch is being applied in the form of $y = ab^x$, the y intercept occurs at (0,a).
- Therefore, the y intercept of an exponential function will always determine the value of a.

Example: Write an exponential function whose graph passes through the points (0,3) & (3, 24).

Step 1: Write the equation $y = ab^x$ replacing "a" with the y intercept. $y = 3b^x$

Step 2: Substitute in the values of x & y from the second point and solve for "b."

$y = 3b^x \rightarrow \frac{24}{3} = \frac{3(b)^3}{3}$

$b^3 = 8 \quad b = 2$

Step 3: Write the full equation: $y = ab^x$ with values of a & b inserted. $y = 3(2)^x$

Practice: Write an exponential function for the graph that passes through the given points.

1. (0, 4) and (2, 36)

$y = 4(b)^x$

$\frac{36}{4} = \frac{4(b)^2}{4}$

$9 = b^2$

$b = 3$

$y = 4(3)^x$

2. (0, 5) and (6, 320)

$y = 5b^x$

$\frac{320}{5} = \frac{5b^6}{5}$

$b^6 = 64$

$b = 2$

$y = 5(2)^x$

Calculator!! Exponential regression.

3. (0, 256) and (4, 81)

Stat edit

L_1 = x values

L_2 = y values

Stat calc Exp. Reg ↓Calc Enter

$y = 256\left(\frac{3}{4}\right)^x$

4. (0,6.4) and (3, 100)

L_1	L_2
0	6.4
3	100

$y = 6.4(2.5)^x$

Application: An experiment starts with 7500 bacteria cells. After 4 hours there are 23,000 cells. Write an exponential function to model the number of cells after x hours.

(0, 7500)

(4, 23,000)

$y = 7500(1.323)^x$

Compound Interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

A = ending amt. P = beginning principle r = rate as a decimal n = # times compounded per year t = # years

Example:

An investment pays 4.2% annual interest compounded monthly. If $2500 is invested, what will be the balance after 15 years?

4.2% = 0.042 (12 times per year)

$A = 2500\left(1 + \frac{.042}{12}\right)^{12(15)} = \$4688.87$

1. Determine how much is in a retirement account after 20 years if $5,000 was invested at 6.05% interest, compounded weekly.

6.05% = 0.0605 (52 times per year)

$A = 5000\left(1 + \frac{.0605}{52}\right)^{(52)(20)} = \$16,755.63$

What is the difference in the balance if the interest is compounded daily?

$A = 5000\left(1 + \frac{.0605}{365}\right)^{(365)(20)} = \$16,765.74$ (365 days in 1 year)

2. A college savings account pays 8.2% annual interest, compounded semi-annually. What is the balance after 12 years if $21,000 was initially invested?

8.2% = .082 (t = 12, P = 21,000, 2 times per year)

$A = 21,000\left(1 + \frac{.082}{2}\right)^{12(2)} = \$55,085.44$

What is the ending balance if the current interest rate is only 2.1%?

2.1% = .021

$A = 21,000\left(1 + \frac{.021}{2}\right)^{12(2)} = \$26,983.04$