Exponential Functions

Objective: SWBAT use the compound interest formula

Language Objective: SWBAT explain benefits of Compound Interest to a partner in a Think Pair Share activity

Agenda

1) Take out **HW** to be checked
2) **Do Now** - Linear, Quadratic or Exponential?
   - check HW definitions with partner
3) **Would you Rather...?**
4) **Compound Interest** Equation
5) **Practice**

HW: "Day 4 Homework" worksheet

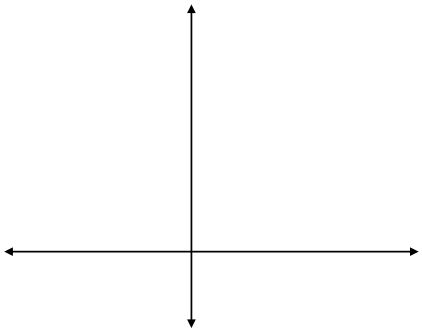
DO NOW

1) Identify each of the following as Linear, Quadratic, or Exponential.

a) $g(x) = 10x + 3$ b) $k(x) = x(77 - x)$ c) $p(x) = 12(2)^x$

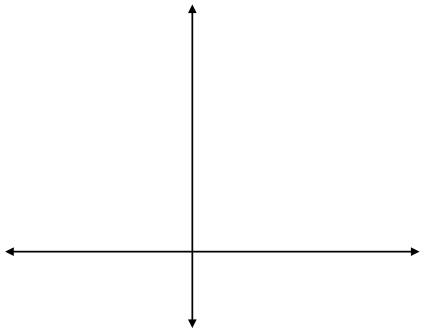
2) **Sketch** the following graphs.
The only point you must **indicate** is is the **y-intercept**.
Circle whether each graph is Linear, Exponential, or Quadratic.

a) $y = x^2$



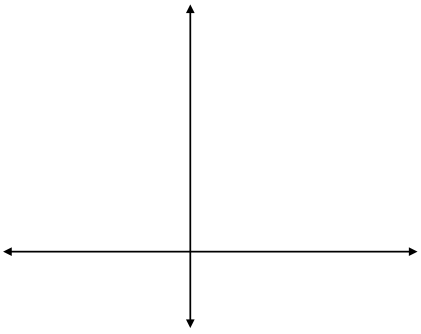
Linear / Exponential / Quadratic.

b) $y = 2x$



Linear / Exponential / Quadratic.

c) $y = 2^x$



Linear / Exponential / Quadratic.

DO NOW

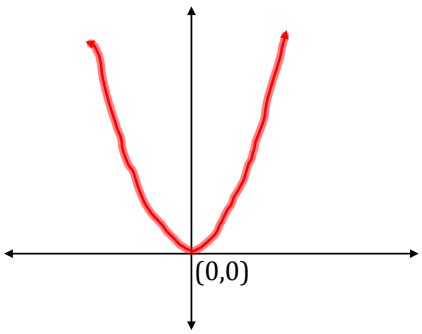
1) Identify each of the following as Linear, Quadratic, or Exponential.

a) $g(x) = 10x + 3$ b) $k(x) = x(77 - x)$ c) $p(x) = 12(2)^x$

Linear *Quadratic* *Exponential*

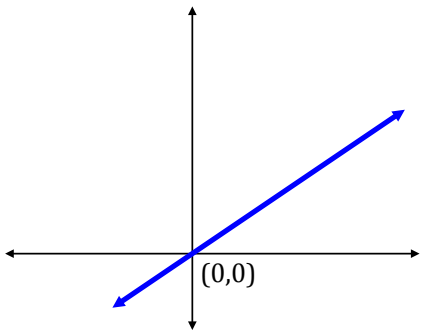
2) **Sketch** the following graphs.
The only point you must **indicate** is is the **y-intercept**.
Circle whether each graph is Linear, Exponential, or Quadratic.

a) $y = x^2$



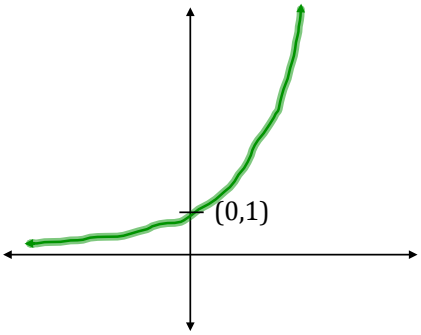
Linear / Exponential / (Quadratic.)

b) $y = 2x$



(Linear) / Exponential / Quadratic.

c) $y = 2^x$



Linear / (Exponential) / Quadratic.

Think Pair Share...
"Would you Rather"

Your parents invested $5000 into a bank account that gives an interest rate of 1%. They plan to give you the money they day you graduate high school to help you begin the next phase of your life.

Your parents had 2 options: They could invest in an account that compounds interest ***annually*** or invest in an account that **compounds interest *weekly***.

Think....

Would You Rather your parents have chosen the account that compounds **annually** or **weekly**?

Pair....

Discuss with your partner which account you would prefer

Share....

Tell the class which account you would prefer and why?

Growth/Decay Formula

$$A(t) = P(1 \pm r)^t$$

Compound Interest

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

A= _Accumulated Amount of money_

P = _Principal (initial amount)_

r = _annual interest Rate_

n = _number of times compounded per year_

t = _Time (in years)_

Your parents invested $5000 into a bank account that gives an interest rate of 1%. They plan to give you the money they day you graduate high school to help you begin the next phase of your life.

Your parents had 2 options:

They could invest in an account that compounds interest ***annually***

They could invest in an account that **compounds interest *weekly***.

Growth/Decay Formula

$$A(t) = P(1 \pm r)^t$$

Compound Interest

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

A= ***Accumulated Amount*** *of* money

P = ***Principal*** *(initial amount)*

r = *annual interest* ***Rate***

n = ***number*** *of times compounded* ***per year***

t = ***Time*** *(in years)*

Your parents invested $5000 into a bank account that gives an interest rate of 1%. They plan to give you the money they day you graduate high school to help you begin the next phase of your life.

Your parents had 2 options:

They could invest in an account that compounds interest ***annually***

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

P = 5000 n = 1
r = .01 t = 18

$$A(18) = 5000\left(1 + \frac{.01}{1}\right)^{(1 \cdot 18)}$$

$$= 5000(1.01)^{(18)}$$

$$= 5,980.74$$

They could invest in an account that **compounds interest *weekly***.

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

P = 5000 n = 52
r = .01 t = 18

$$A(18) = 5000\left(1 + \frac{.01}{52}\right)^{(52 \cdot 18)}$$

$$= 5,985.98$$

Ex 1) Find the final amount of a $100 investment after 10 years at 5% interest compounded:

annually (_____/ year) quarterly (_____/ year)

Ex 2) You can invest $5000 in one of two accounts:

a) annual interest rate of 5.75% compounded daily

b) annual interest rate of 6% compounded yearly

You plan to take your money out in 10 years. Which is the better investment?

Ex 3) Find the final amount for each investment:

a) $1000 at 6% interest compounded annually for 20 years.

b) $750 at 10% interest compounded quarterly for 10 years.

c) $1800 at 5.65% interest compounded quarterly for 10 years.

1a) $162.89 1b) $164.36 2a) $8,885.25 2b) $8,954.24 3a) $3207.14 3b) $2013.80 3c) $3,154.51

Day 4 Homework

WORKSHEET #3
Compound Interest **Name** _____

The compound interest formula is a variation of a rate of increase formula that takes into account the numbers of times interest is being paid over the course of one year.

- ***Since interest is being paid many times during the year, only a portion of the yearly interest rate (called the APR by banks) is paid each time. You calculate that portion by dividing the interest rate by the number of times your pay interest per year.***
- ***The number of years you invest for is multiplied by the number of times you pay interest in one year.***
- ***The formula is:*** $A = P\left(1+\frac{r}{n}\right)^{nt}$

List what each variable stands for:

A = _____

P = _____

r = _____

n = _____

t = _____

- Note: the base in this exponential equation is $\left(1+\frac{r}{n}\right)$

That is because it is the "multiplier" we are familiar with from previous problems growth rate problems.
100% + the growth rate for each time interest is paid (both written as decimals) is $1 + \frac{r}{n}$

1. If you invest $5000, compounded quarterly for 10 years, into an account that earns 8% , how much money will you end up with?

P = _____ r = _____ (this is the rate as a decimal)

n = _____ t = _____

Your equation is _____

Your solution is _____.

Day 4 Homework continued...

2. What is the effect of compounding money? Assume that a relative invests $5000 (in your name) on the day you were born. Lucky you! How much money do you have on your 18th birthday if...

   a) His investment earns 6% a year.

   b) His investment earns 6%, compounded quarterly.

   c) His investment earns 6%, compounded monthly.

   d) His investment earns 6%, compounded daily.

3. Suppose that you invest $2000 in an account with a growth rate of 8% a year for 25 years.

   a) How much do you have now?

   b) How much would you have if you had doubled the investment amount?

   c) How much would you have if you had compounded semi-annually (doubled the number of times you were paid interest)?