

Warm-up - GRAPH

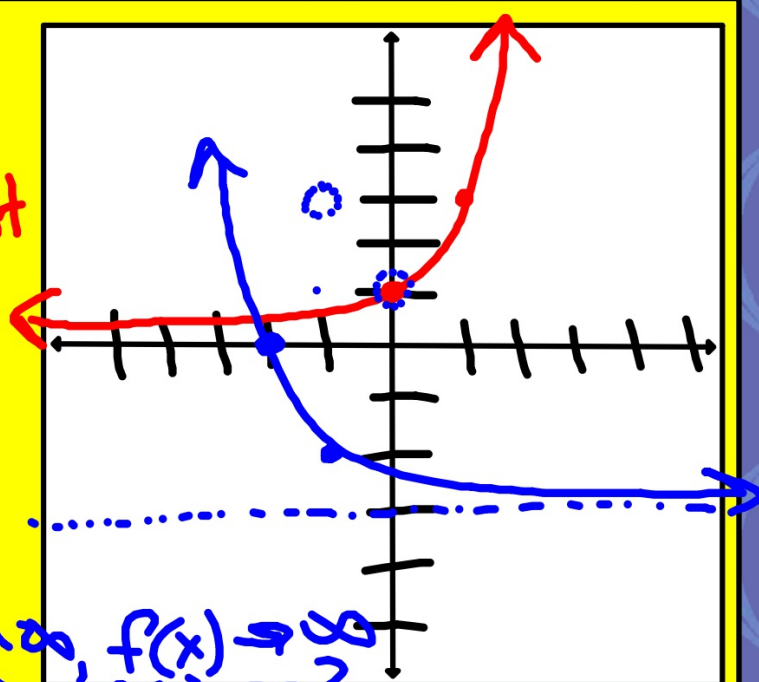
$$y = 3^{-x+1} - 3$$

$$y = 3^x \text{ Parent}$$

$$D: (-\infty, \infty)$$

$$R: (-3, \infty)$$

End Behavior: As $x \rightarrow -\infty$, $f(x) \rightarrow \infty$
 As $x \rightarrow \infty$, $f(x) \rightarrow -3$



Transformation of Parent Graph: Reflection about y-Axis
 Hor. shift left 1, vertical down 3
 HA: $y = -3$

Exponential Functions - Day 2

Sections 8.1, 8.2 Applications of Exponential Functions

- Exponential Growth/Decay
- Compounding Interest

Exponential Growth

$$A = P(1 + r)^t$$

A = Value of item

P = Initial value

r = rate of growth/decay

t = number of years

Write
as decim

In 1990, the cost of tuition at a state university was \$4,300. During the next 8 years, the tuition rose 4% each year.

(a) write an equation that models the situation

$$A = 4,300(1 + 0.04)^t$$

(b) Determine the cost of tuition in 1991.

$$A = 4,300(1 + 0.04)^1$$

$$A = \$4,472$$

(c) Determine the cost of tuition in 1995.

$$A = 4,300(1 + 0.04)^5$$

$$A = \$5,231.61$$

In 1990, the cost of tuition at a state university was \$4,300. During the next 8 years, the tuition rose 4% each year.

- d) How many years after 1990 will it take for the tuition costs to double (assuming the increase remains the same?)

Write an equation that represents the situation.



X	Y
13	7159.8
14	7446.2
15	7744.1
16	8053.8
17	8376
18	8711
19	9059.5

X=18

$$8,600 = 4,300(1 + .04)^t$$

Use your graphing calculator to make a prediction.

18 years



Exponential Decay

$$A = P(1 - r)^t$$

You purchase a car for \$40,000, and it depreciates in value at a rate of 11% each year.

- a) Write an equation to represent the situation.

$$A = 40,000(1 - .11)^t$$

- b) Find the approximate value of your car after 8 years.

$$A = 40000(1 - .11)^8$$
$$A = \$15,746.36$$

Imagine you were given \$10,000 for graduation from high school. If you invested that amount into an account that yields an APR of 4.5% and left the money in your investment for the next 10 years, how much money would you have? How much interest would you accrue?

More Applications of Exponential Functions

A = Value of Account

P = Initial Deposit

r = APR

t = number of years

Compounding Interest

n = number of times per year that the interest compounds

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

Example - A total of \$9,000 is invested at an annual interest rate of 6%. Find the balance after 5 years if it is compounded...

Equation: $A = 9000(1 + \frac{.06}{n})^{5n}$

(a) annually.

$$A = 9000(1 + \frac{.06}{1})^{5 \cdot 1} = \$12,044.03$$

(b) monthly. $12 = n$

$$\$12,139.65$$

(c) daily. $n = 365$

$$\$12,148.43$$

Example - A total of \$1,500 is invested at an annual interest rate of 5.25%. Determine the interest accrued after 3 years if it is compounded...

$$A = 1500 \left(1 + \frac{0.0525}{n}\right)^{3n}$$

(a) semi-annually. $n=2$

$$A = 1,752.31$$

$$\text{Interest} = \$252.31$$

(b) quarterly. $n=4$

$$A = 1,754.07$$

$$\text{Interest} = \$254.07$$

(c) weekly. $n=52$

$$A = 1,755.73$$

$$\text{Interest} = \$255.73$$

Continuous Compounding

You deposit \$2,000 to an account that pays 8% annual interest. How much does the account have in four years if the interest is compounded continuously?

Continuous Compounding

$$A = Pe^{rt}$$

A: Value of Account

P: Initial Deposit (principal)

R: APR

t: Number of years

e: 2.71828

Continuous Compounding

Rich Deposits \$3200 into a bank account that has an APR of 3.1% compounded continuously.

$$A = Pe^{rt}$$

a) How much is in the account after 17 years?

$$A = 3,200e^{.031 \cdot 17}$$

$$A = 5,420.30$$

b) How much interest is accrued?

$$\$2,220.30$$

