Bellwork: Find the rate of change of f(x) on the interval [2,7]

a,b

$f(x) = (x-6)^2-1$

$$\boxed{\frac{f(b)-f(a)}{b-a}}$$

$f(7) = (7-6)^2-1 = 1-1 = 0$

$f(2) = (2-6)^2-1 = (-4)^2-1$

$16-1=15$

$\frac{f(7)-f(2)}{7-2}$ $\frac{f(2)-f(7)}{2-7}$

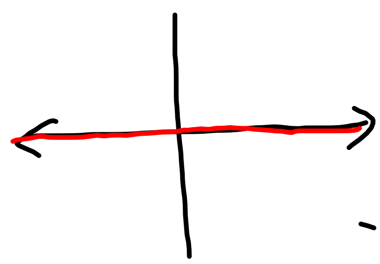
$$\frac{0-15}{7-2} = \frac{-15}{5} = \boxed{-3}$$

5) EXP > Quad > Linear

5^x x^2 x

a - greatest b - least

14) $f(x) = 0$



Lesson 2.5 Objectives

1. I can use properties of functions to solve real world problems

2. I can identify and create equivilent forms of expressions

Modeling with Functions

Functions can be useful models of real-world phenomena. Here are a few examples.

- Linear Functions
  - Use to model things with constant or fixed rates of change.
- Quadratic Functions
  - Use to model the height of falling objects.
  - Use to model area of shapes.
- Exponential Functions
  - Use to model population growth.
  - Use to model financial growth with compound interest.

Can you think of more examples?

Example 1

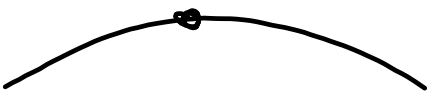
x y

The height of a football for a certain throw to a receiver can be modeled by $h(t) = -16(t-1.5)^2 + 42$, where t is time in seconds and $h(t)$ is the ball's height in feet.

A. What is the height of the ball at the moment it is thrown ($t = 0$ sec.)? $h(0) = 6$

B. Identify the vertex of the model. What does each coordinate of the vertex represent in context?

$h(0) = -16(0-1.5)^2 + 42$



$(1.5, 42)$

t $h(t)$

Example 2

For home repair service, a plumber charges a flat fee of \$50 for a visit plus \$80 per hour for labor.

A. Write a function to model the total cost of a repair for h hours spent on labor.

$c(h) = 80h + 50$

B. If your bill was \$610, how long was the plumber working on your repair?

$610 = 80h + 50$

$-50 \qquad\qquad -50$

$\frac{560}{80} = \frac{80h}{80} = \boxed{h = 7}$

Example 3

The model $A(t) = 2000(1+0.03)^t$ is used to calculate the amount of money in account t years after an initial deposit of \$2000 is made. The account pays 3% interest, compounded annually.

A. What is the account balance at the end of year 5? $A(5) = 2000(1+.03)^5$

\$ 2318.54

B. Create a similar model for an account with an initial deposit of \$350 that pays 6.5%, compounded annually.

$\boxed{A(t) = 350(1+.065)^t}$ $\frac{6.5}{100}$

Equivalent Forms of expressions will be the same once simplified

$$\frac{2}{3} \quad \frac{10}{15} = \frac{16}{24} = \frac{2}{3} \qquad \frac{4}{6} = \frac{2}{3}$$

Show algebraically why each pair of expressions is equivalent.

$$\frac{1}{3^x} = \frac{1^x}{3^x} = \left(\frac{1}{3}\right)^x = 3^{-x} = \frac{1}{3^x}$$

Show algebraically why each pair of expressions is equivalent.

$$\frac{1}{5} + x = \frac{5x+1}{5} = \frac{5x}{5} + \frac{1}{5} = x + \frac{1}{5}$$

Show algebraically why each pair of expressions is equivalent.

$$9^4 = 3^8$$

$$(3^2)^4 = 3^8 = 6561$$

Show algebraically why each pair of expressions is equivalent.

$$\sqrt[2]{12x^2} = 2x\sqrt{3} \quad = \quad 2x\sqrt{3}$$

4 3

$\boxed{2 \cdot 2}$