(A) Lesson Context

BIG PICTURE of this UNIT:	• What is a Polynomial and how do they look? • What are the attributes of a Polynomial? • How do I work with Polynomials?		
CONTEXT of this LESSON:	Where we've been We have discussed the basics: degree, type, and operations (+, –, x)	Where we are What are the key attributes of a polynomial and how do these affect the shape?	Where we are heading What are the key attributes of a polynomial and how do these affect the shape?

(B) Lesson Objectives:

a. Work on and attempt to develp an understanding of KEY Vocabulary.
b. Begin to analyze the the attributes of a polynomial function and it's effect on the graph.
c. Observations and patterns in the graphs of polynomials.
d. Solidify our perdictions of how polynomials behave.

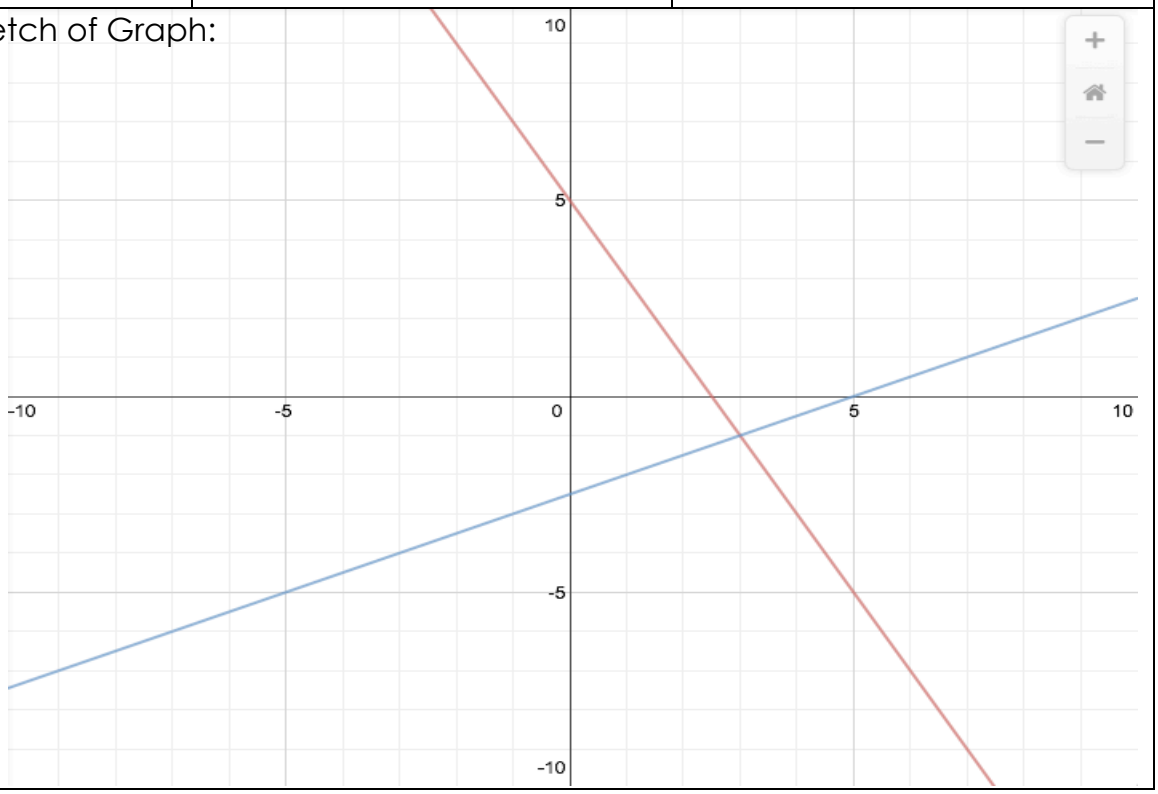
(C) Some Context

Lets try and get a grasp on what a Polynomail is, and then we will attempt to develop an understanding of the related vocabulary. So first, some context. In each of the senarios below please come up with an appropriate polynomial that models each situation.

Part 1: Graph Exploration: You will be using Desmos to develop sketches of our given polynomials functiosn. You will then be asked to make some observations about attributes of the polunomials functions and how those attributes affect the graphs.

1. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

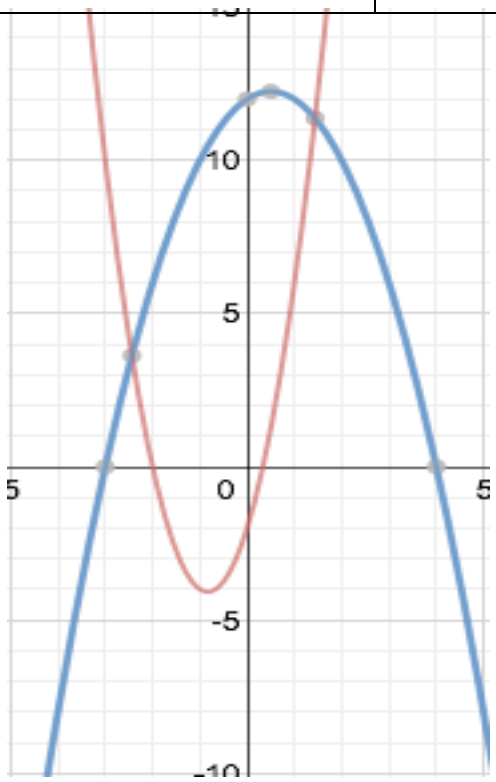
Factored Form Equation $y = -2x + 5$ $y = \frac{x}{2} - \frac{5}{2}$	**Standard Form Equation** 2x + y = 5 -x +2y = -5	
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial	
Degree of Polynomial: 1	**Leading Coefficient:** 2, -1	
Constant Term: 5, -5/2	**Leading Coefficient:** Positive or Negative 2, -1	
X Intercepts: 5/2 , 5	**Y Intercept:** 5, -5/2	

DESMOS Window"	Sketch of Graph:
X Min: -10 X Max: 10 Y Min: -10 Y Max: 10	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

2. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

Factored Form Equation $y = (3x - 1)(x + 2)$ $y = (4 - x)(x + 3)$	**Standard Form Equation** $y = 3x^2 + 5x - 2$ $y = -x^2 + x + 12$	
Circle One: Linear, <u>Quadratic,</u> Cubic, Quartic, Quintic	Monomial, Binomial, <u>Trinomial</u>, Polynomial	
Degree of Polynomial: 2	**Leading Coefficient:** 3, -1	
Constant Term: -2, 12	**Leading Coefficient:** Positive or Negative 3, -1	
X Intercepts: 1/3, 2 & 4, -3	**Y Intercept:** -2 & 12	

DESMOS Window"	Sketch of Graph:
X Min: -5 X Max: 5 Y Min: -5 Y Max: 15	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

3. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

Factored Form Equation $y = (x - 4)(x + 5)$ $y = (5 - x)(x + 4)$	**Standard Form Equation** $y = x^2 + x - 20$ $y = -x^2 + x + 20$	
Circle One: Linear, <u>Quadratic</u>, Cubic, Quartic, Quintic	Monomial, Binomial, <u>Trinomial</u>, Polynomial	
Degree of Polynomial: 2	**Leading Coefficient:** 1, -1	
Constant Term: -20, 20	**Leading Coefficient:** Positive or Negative 1, -1	
X Intercepts: 4, -5 & 5, -4	**Y Intercept:** -20 & 20	

DESMOS Window"

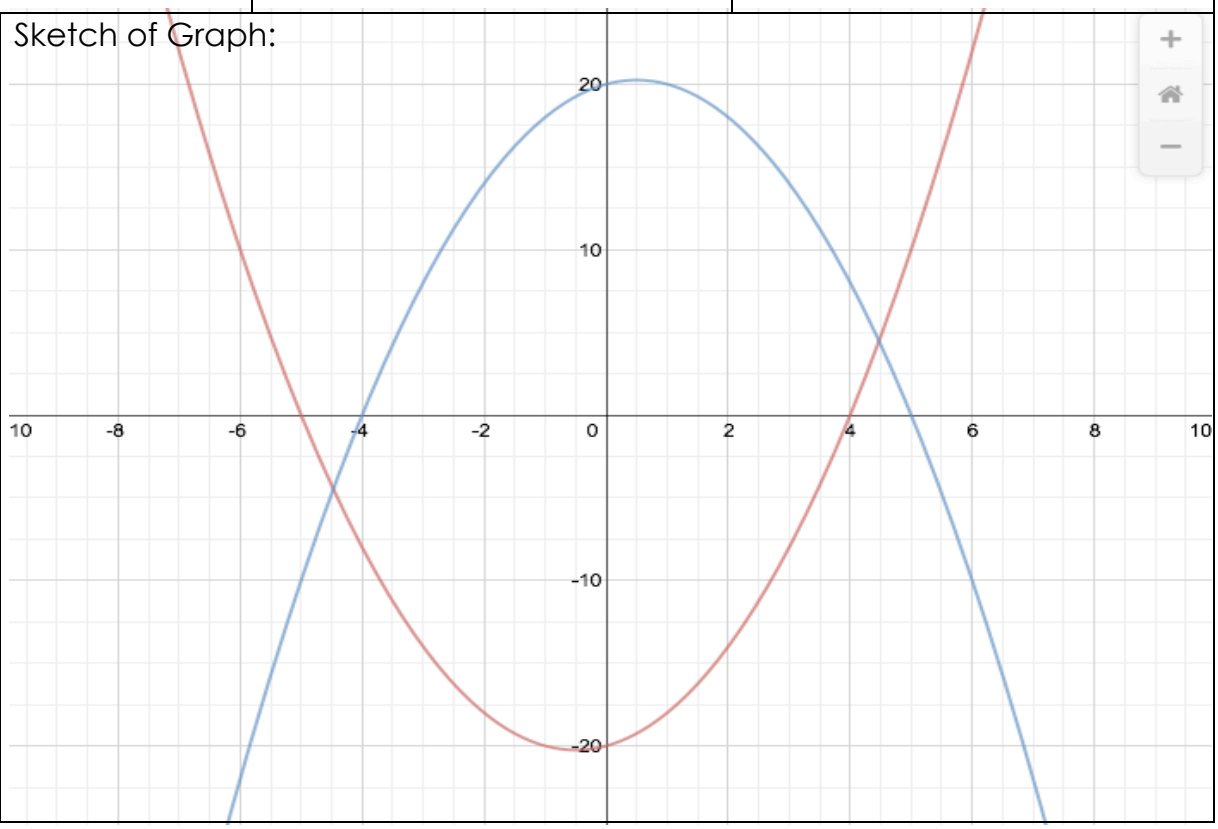
X Min: -10

X Max: 10

Y Min: -25

Y Max: 25

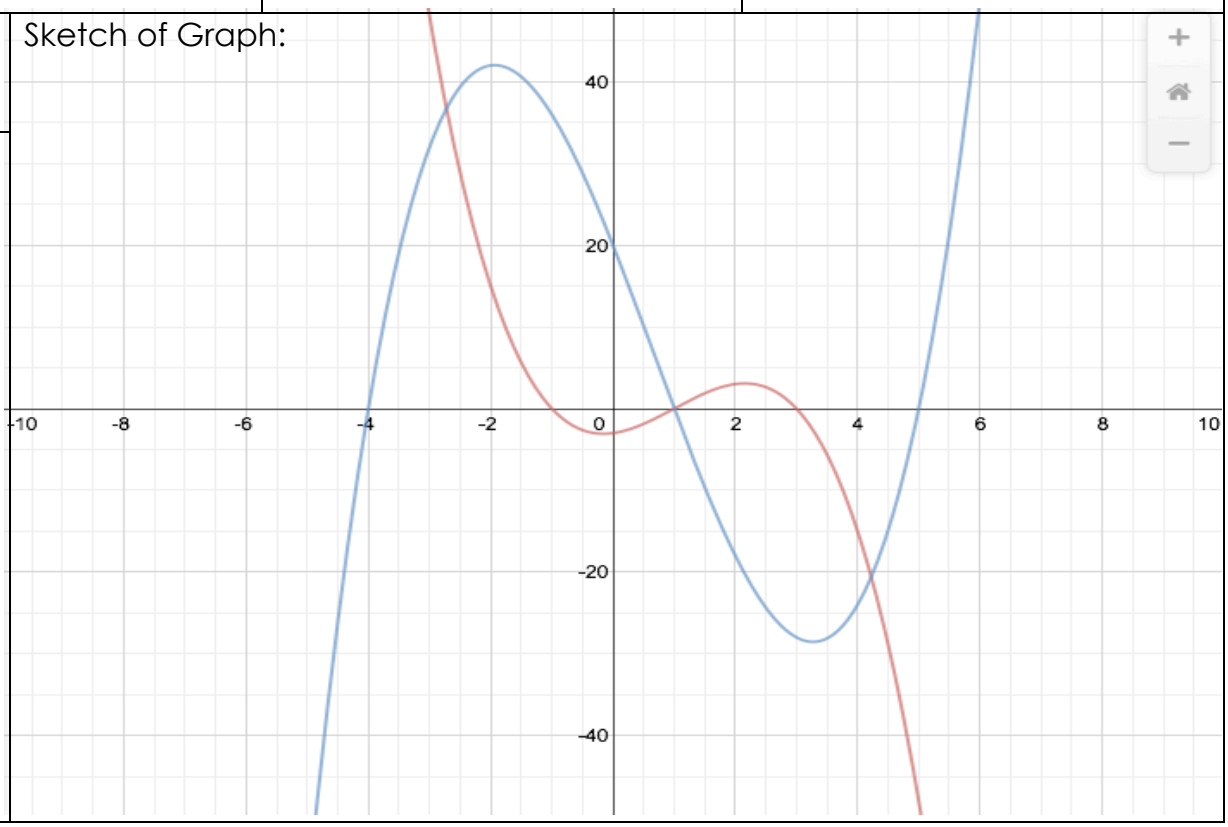
Sketch of Graph:



Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

4. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

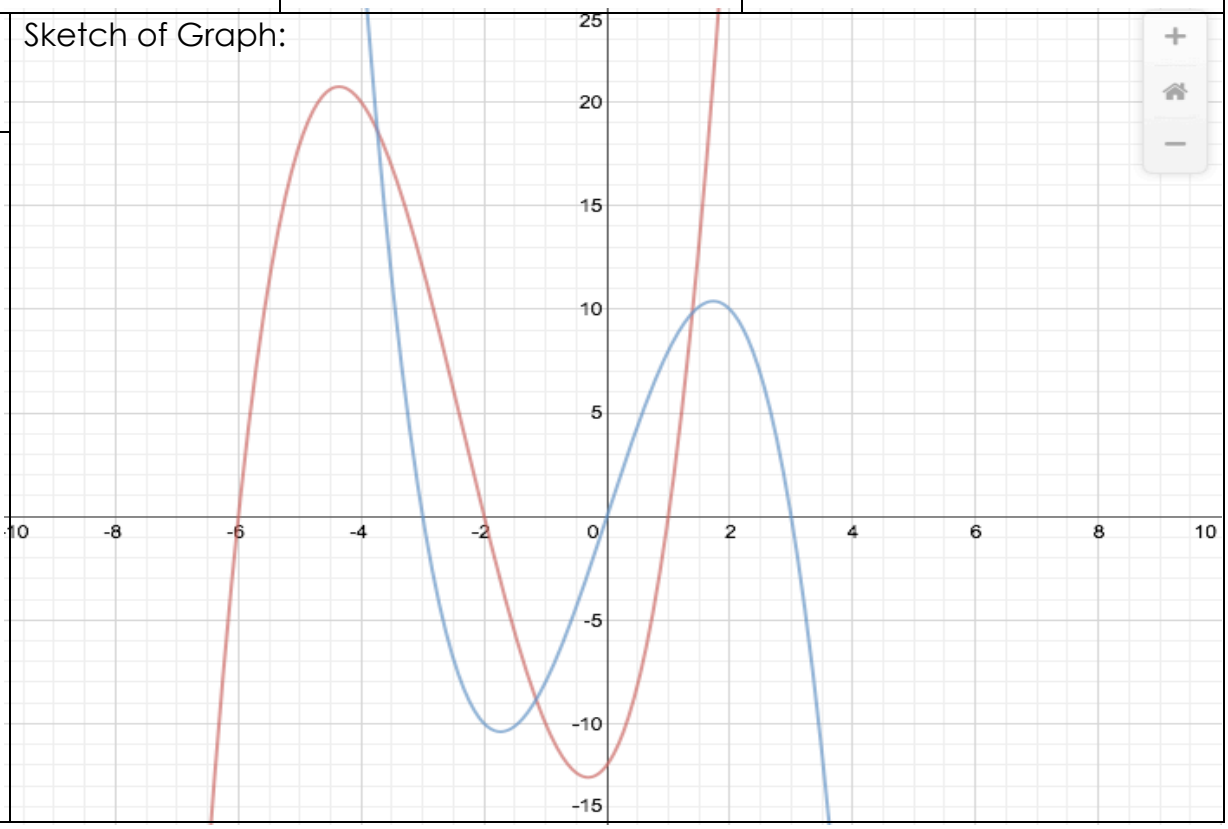
Factored Form Equation $y = -(x-3)(x-1)(x+1)$ $y = (x+4)(x-1)(x-5)$	**Standard Form Equation** $y = -x^3 + 3x^2 + x - 3$ $y = x^3 - 2x^2 - 19x + 20$	
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial	
Degree of Polynomial: 3	**Leading Coefficient:** -1, 1	
Constant Term: -3, 20	**Leading Coefficient:** Positive or Negative 1, -1	
X Intercepts: -3, 1, -1 & -4, 1, 5	**Y Intercept:** -3, 20	

DESMOS Window"	Sketch of Graph:
X Min: -10 X Max: 10 Y Min: -50 Y Max: 50	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

5. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

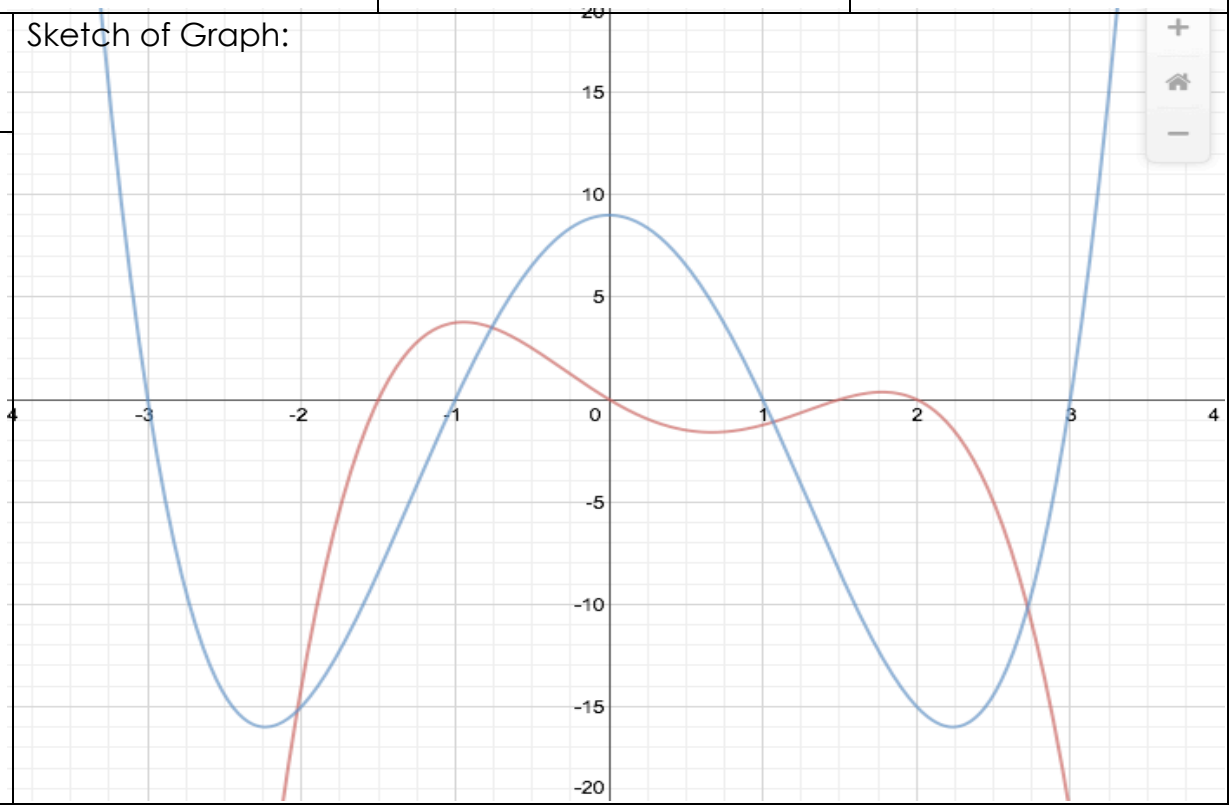
Factored Form Equation $y = (x - 1)(x + 2)(x + 6)$ $y = -x(x - 3)(x + 3)$	**Standard Form Equation** $y = x^3 + 7x^2 + 4x - 12$ $y = -x^3 + 9x$	
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial	
Degree of Polynomial: 3	**Leading Coefficient:** 1, -1	
Constant Term: -12, 0	**Leading Coefficient:** Positive or Negative 1, -1	
X Intercepts: -6, -2, 1 & -3, 0, 3	**Y Intercept:** -12, 0	

DESMOS Window"	Sketch of Graph:
X Min: -10 X Max: 10 Y Min: -15 Y Max: 25	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

6. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

Factored Form Equation $y = -x(x - 1.5)(x + 1.5)(x - 2)$ $y = (x - 3)(x - 1)(x + 1)(x + 3)$	**Standard Form Equation** $y = -x^4 + 2x^3 + 2.25x^2 - 4.5x$ $y = x^4 - 10x^2 + 9$	
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial	
Degree of Polynomial: 4	**Leading Coefficient:** -1, 1	
Constant Term: 0, 9	**Leading Coefficient:** Positive or Negative 1, -1	
X Intercepts: -1.5, 0, 1.5, 2 & -3, -1, 1, 3	**Y Intercept:** 0, 9	

DESMOS Window"	Sketch of Graph:
X Min: -4 X Max: 4 Y Min: -20 Y Max: 20	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

7. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

Factored Form Equation $y = x(x-2)(x+2)(x+4)$ $y = (x+1)(x-3)(x-6)(x-1)$	**Standard Form Equation** $y = x^4 - 20x^2 + 64$ $y = 2x^4 - 39x^3 + 252x^2 - 621x + 486$	
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial	
Degree of Polynomial: 4	**Leading Coefficient:** 1, 2	
Constant Term: 64 , 486	**Leading Coefficient:** Positive or Negative 1, 2	
X Intercepts: -4, -2, 2, 4 & 2/3, 3, 6, 9	**Y Intercept:** 64, 486	

DESMOS Window"

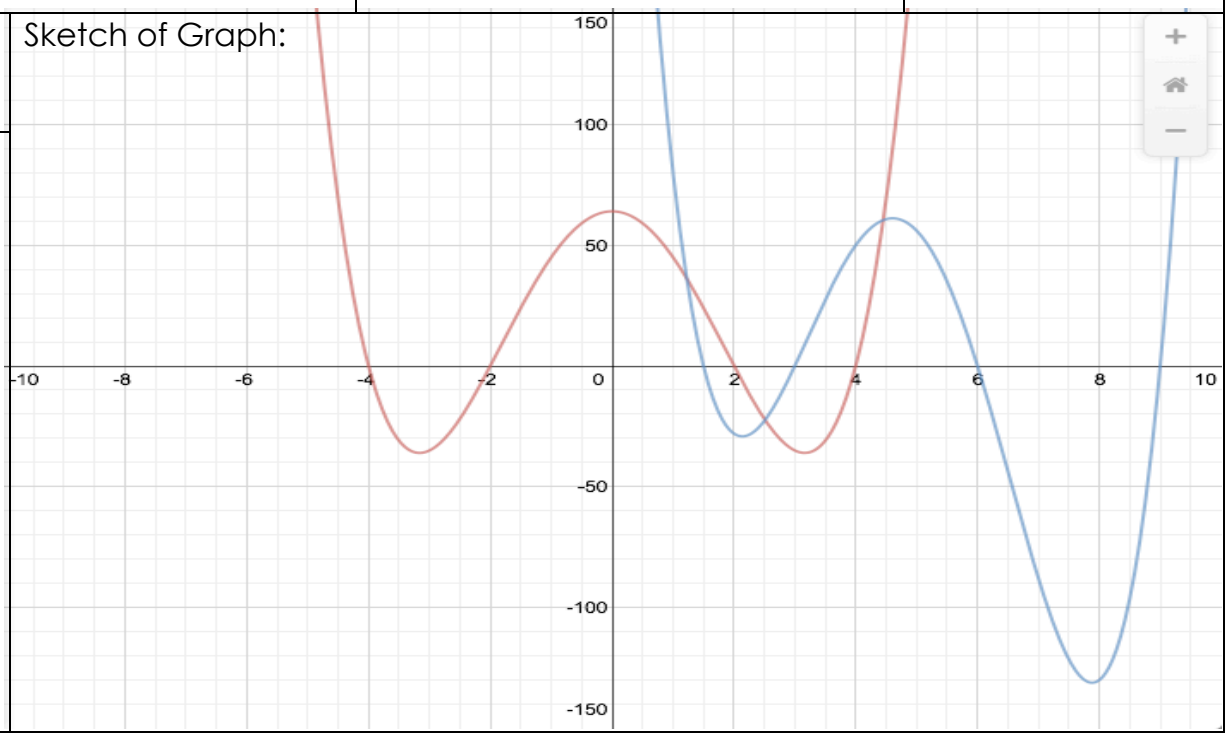
X Min: -10

X Max: 10

Y Min: -150

Y Max: 150

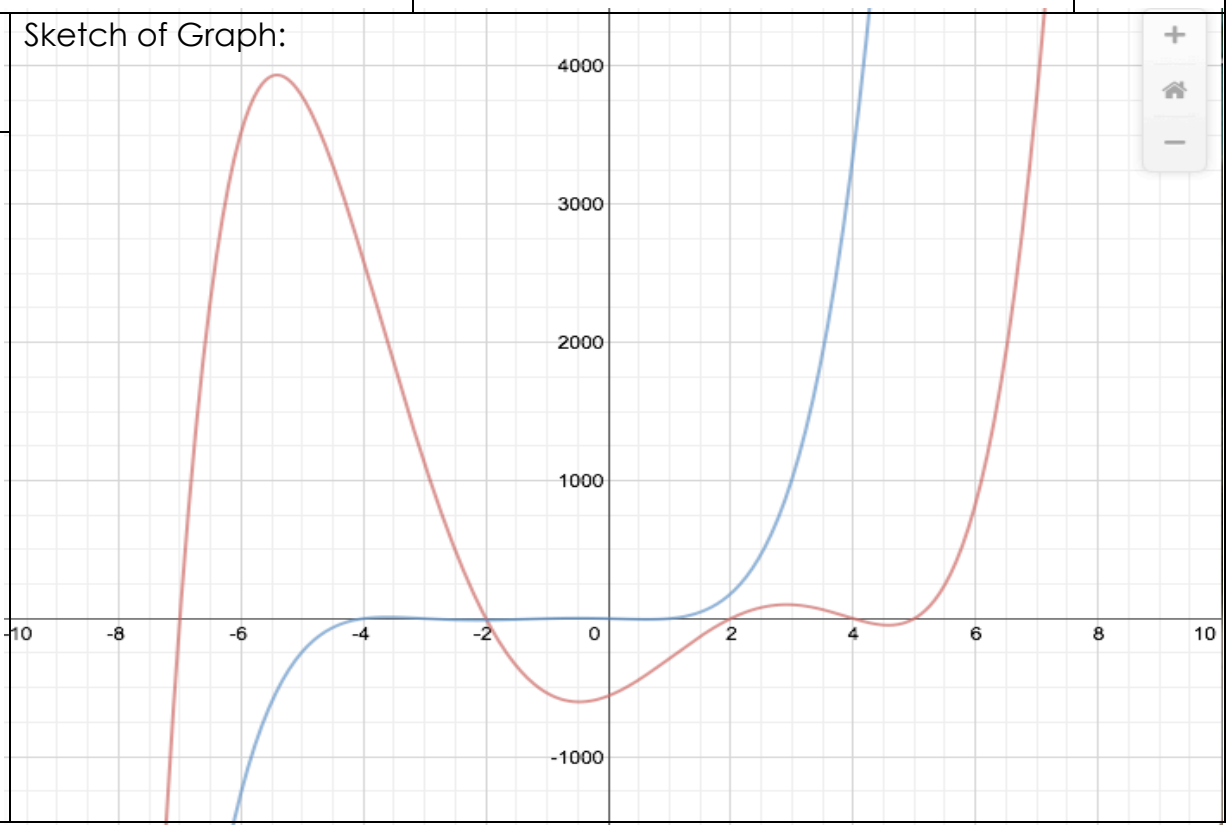
Sketch of Graph:



Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

8. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

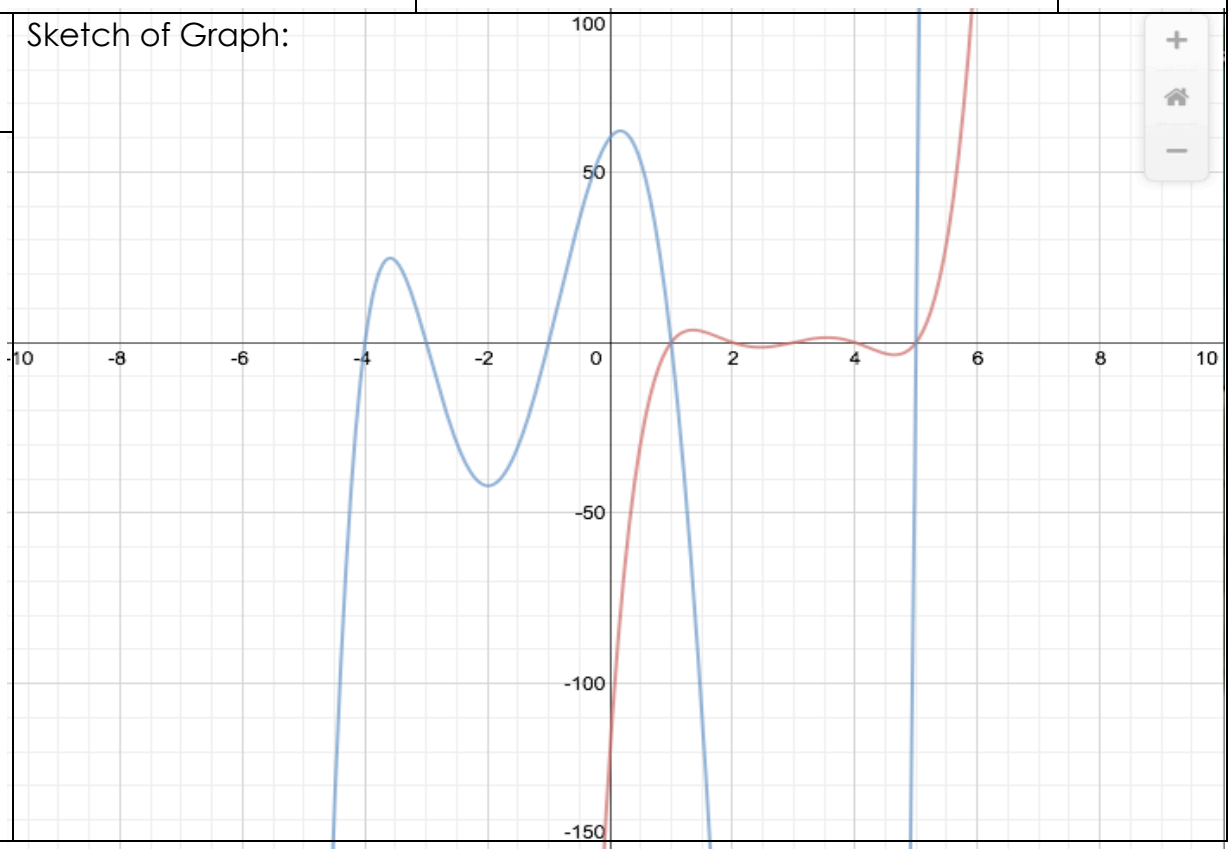
Factored Form Equation $y = (x - 4)(x - 2)(x + 7)(x - 5)(x + 2)$ $y = x(x + 1)(x + 3)(x - 1)(x + 4)$	**Standard Form Equation** $y = x^5 - 2x^4 - 47x^3 + 148x^2 + 172x - 560$ $y = x^5 + 7x^4 + 11x^3 - 7x^2 - 12x$
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial
Degree of Polynomial: 5	**Leading Coefficient:** 1
Constant Term: -560, 0	**Leading Coefficient:** Positive or Negative 1
X Intercepts: -7, -2, 2, 4, 5 & -4, -3, -1, 0, 1	**Y Intercept:** -560, 0

DESMOS Window"	Sketch of Graph:
X Min: -10 X Max: 10 Y Min: -1500 Y Max: 4500	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

9. For the two equations below, please complete the tables for each in a different color. Make sure to draw the graphs of each in a different color as well.

Factored Form Equation $y = (x - 1)(x - 2)(x - 3)(x - 4)(x - 5)$ $y = (x - 5)(x + 1)(x + 3)(x + 4)(x - 1)$	**Standard Form Equation** $y = x^5 - 15x^4 + 85x^3 - 225x^2 + 274x - 120$ $y = x^5 + 2x^4 - 24x^3 - 62x^2 + 23x + 60$
Circle One: Linear, Quadratic, Cubic, Quartic, Quintic	Monomial, Binomial, Trinomial, Polynomial
Degree of Polynomial: 5	**Leading Coefficient:** 1
Constant Term: -120, 60	**Leading Coefficient:** 1 Positive or Negative
X Intercepts: 1, 2, 3, 4, 5 & -4, -3, -1, 1, 5	**Y Intercept:** -120, 60

DESMOS Window"	Sketch of Graph:
X Min: -10 X Max: 10 Y Min: -150 Y Max: 100	

Connections: What connections can you make between the graph, and the equaitons? List as many as you can see!

Connections:

What connections do you see between the **x intercepts** and either of the **equations**? _____

What connections do you see between the **y intercepts** and the **equations**? _____

What connections do you see between the **SHAPE** of the graph and the **DEGREE**? ? _____

What connections do you see betweenthe **SHAPE** of the graph and the **Leading Coefficient**?