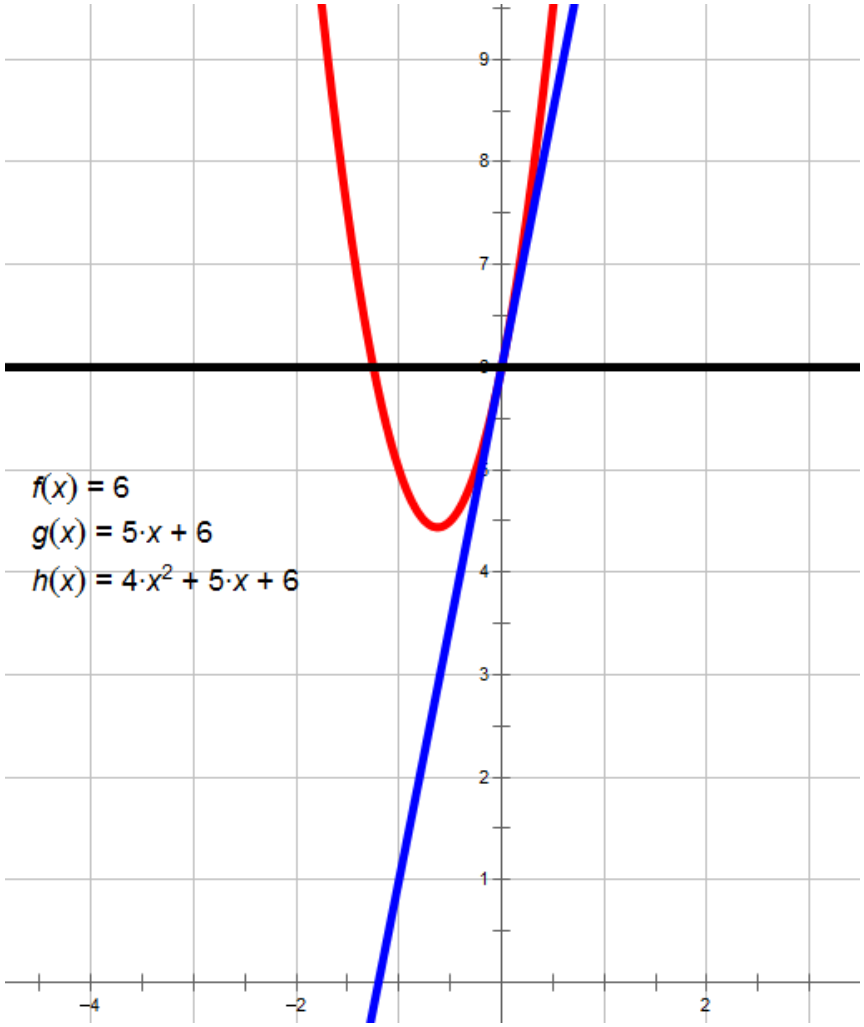
DO NOW

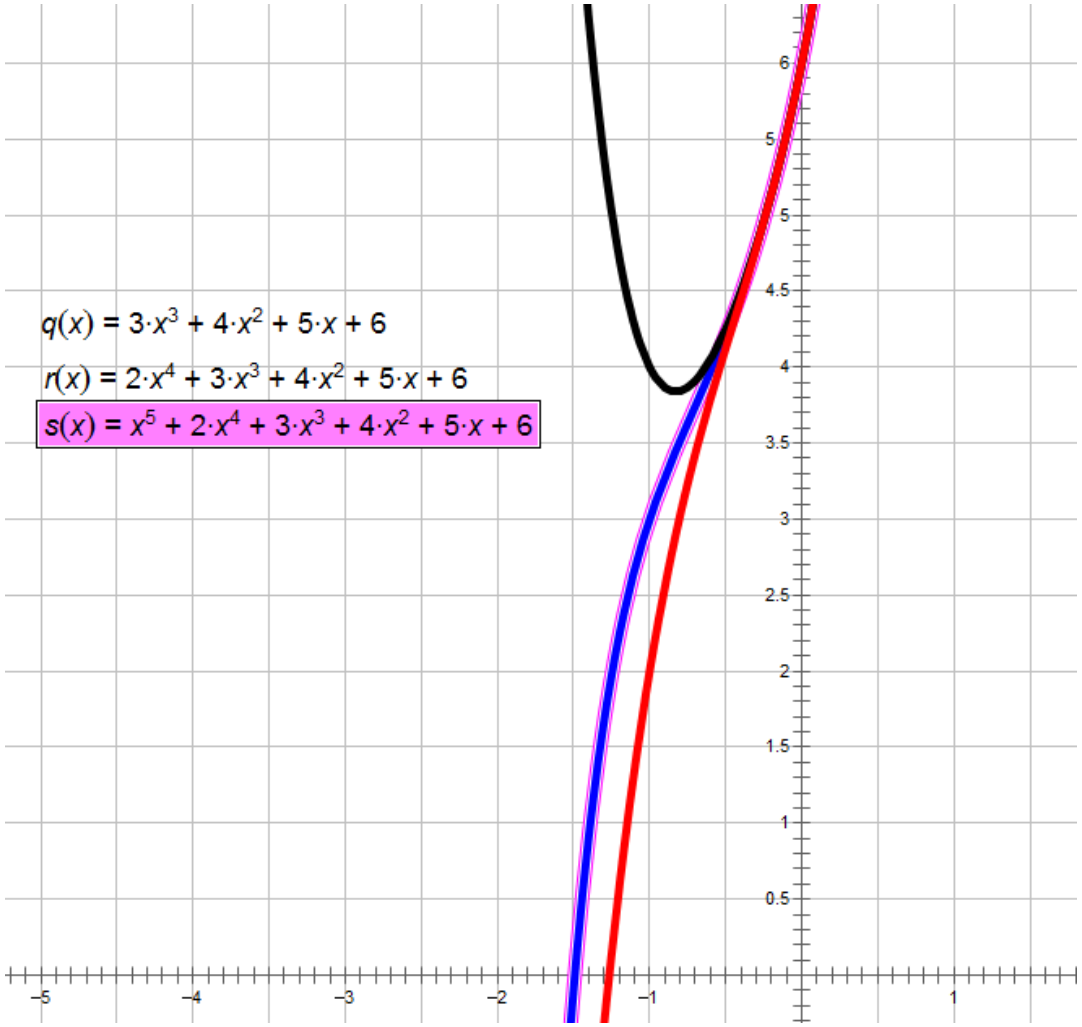
- Using your graphing calculator, graph the following and note the characteristics of each graph (End Behavior, Maximum(s)/Minimum(s), Number of x- and y-intercepts)

1. $f(x) = 6$
2. $g(x) = 5x + 6$
3. $h(x) = 4x^2 + 5x + 6$
4. $q(x) = 3x^3 + 4x^2 + 5x + 6$
5. $r(x) = 2x^4 + 3x^3 + 4x^2 + 5x + 6$
6. $s(x) = x^5 + 2x^4 + 3x^3 + 4x^2 + 5x + 6$

GRAPHS



GRAPHS


$q(x) = 3 \cdot x^3 + 4 \cdot x^2 + 5 \cdot x + 6$
$r(x) = 2 \cdot x^4 + 3 \cdot x^3 + 4 \cdot x^2 + 5 \cdot x + 6$
$s(x) = x^5 + 2 \cdot x^4 + 3 \cdot x^3 + 4 \cdot x^2 + 5 \cdot x + 6$
6
5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
−5
−4
−3
−2
−1
1

ESSENTIAL QUESTIONS

- How can you use the degree and leading coefficient of a polynomial to make predictions about the graph of a polynomial?
- What are the zeros of a polynomial function and how can they be determined?
- How can we use the factored form to solve a polynomial equation?
- What is the role of zeros and end behaviors when sketching a graph of a polynomial function?
- What is the role of the graphing calculator when solving polynomial equations?
- What are relative extreme values of a polynomial function?

LEARNING GOAL

- SWBAT:
  - analyze, model, solve, and graph polynomial functions including problems that involve real world scenarios.

CLASS AGENDA

- Do Now
- Definitions
- Small Group Practice
  - Writing in expanded form
  - Identifying the Degree of the function
  - Identifying the Leading Coefficient
- Break
- Synthetic substitution
- Small Group Practice
- Closure

DEFINITIONS

- *Polynomial*
  - *an expression that can be written in the form:*
  - $a_n x^n + a_{n-1} x^{n-1} \ldots a_2 x^2 + a_1 x + a_0$
  - *n is a NONNEGATIVE integer*
- *Terms*
  - $a_n x^n,\ a_{n-1} x^{n-1},\ a_2 x^2,\ a_1 x, and\ a_0$
- *Coefficients*
  - $a_n,\ a_{n-1},\ a_2,\ a_1, and\ a_0$
- *Leading Term*
  - *The term containing the highest power of x*
- *Leading Coefficient*
  - *The coefficient of the leading term*

DEGREE

Degree	Name	Example
0	Constant	5
1	Linear	$3x + 2$
2	Quadratic	$x^2 - 4$
3	Cubic	$x^3 + 2x + 1$
4	Quartic	$-3x^4 + x$
5	Quintic	$x^5 + \pi x^4 - 3.1x^3 + 11$

POLYNOMIAL OR NOT?

- $f(x) = 2x^3 - 32x$ $\quad and \quad$ $g(x) = \frac{x+1}{x-1}$

EXPANDED FORM

- *Write the function including ALL degrees*
- $f(x) = x^3 - x + 4$
- $g(x) = 5x^5 + 3x^3 - 2$
- $h(x) = 2x^2 - 4x^4 - 3$

SMALL GROUP PRACTICE

- *Is it a function?*
- *Write in expanded form*
- *Identify the Degree of the function*
- *Identify the Leading Coefficient*

1. $f(x) = \frac{x^3+2x^2-1}{x-1}$
2. $g(x) = x^2 - 3x^3 + 1$
3. $h(x) = x^4 - 2x^2$
4. $s(x) = 4x^3 - 5x^5 + 2$
5. $t(x) = 1 - 2x^3 + 3x^2 - 3x^5$

BREAK

ROOTS / ZEROS

- Root or Zero
  - Any value for x which P(x) = 0

- *How would you determine the roots/zeros?*
  - $f(x) = x^2 - 4$

  - $g(x) = 2x^3 - 32x$

VALUES OF THE FUNCTION

- $f(x) = 3x^4 - 7x^3 - 5x^2 + 9x + 10$, *find:*

1. *f(2)*

2. *f(-3n)*

SYNTHETIC SUBSTITUTION

- *Can be used to find ANY value of the function*
- $f(x) = 3x^4 - 7x^3 - 5x^2 + 9x + 10$, *find:*

1. *f(2)* $= 3 \quad -7 \quad -5 \quad 9 \quad 10$

2. *f(-3n)*$= 3 \quad -7 \quad -5 \quad 9 \quad 10$

SMALL GROUP PRACTICE

- Determine the given value of each function

1. $h(x) = 2x^2 - 5x + 6$
   1. $h(-1)$
   2. $h(2i)$
   3. $h(1 + i)$
   4. $h(3a)$

2. $P(x) = 8x - 4x^2$
   1. $P\left(2\sqrt{3}\right)$
   2. $P\left(1 - \sqrt{2}\right)$
   3. $P(1 + 2i)$
   4. $P\left(\frac{2}{x}\right)$

CLOSURE

CLOSURE

- How do you determine the Degree of a function?
- How can you use synthetic substitution to find the value of a function?