SUM AND DIFFERENCE OF CUBES

- ***Factor***
- ***SOAP {Same, Opposite, Always Positive}***
- ***(a   b)(a² ab   b²)***

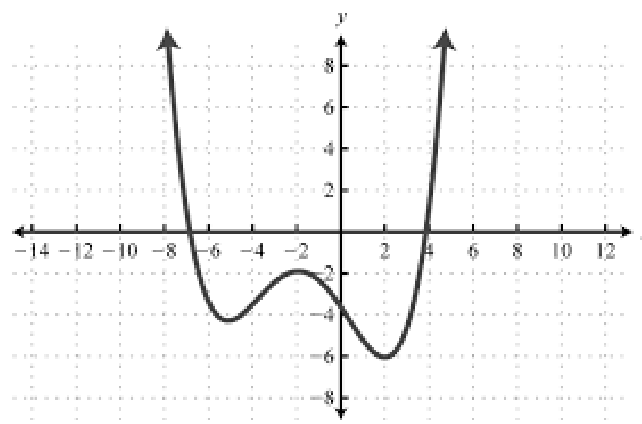
1.) Factor

A. $64y^3 - 125$ B. $16x^3 + 54$ C. $x^6 + 27y^3$

CHARACTERISTICS OF GRAPHS

- ***Identify Domain, Range, Intervals on Increase and Decrease (use x values), Roots (x-intercepts), y intercept, End behavior, Absolute Min/Max (very lowest/highest), Relative Min/Max (turning points)***
- ***Minimum degree is always +1 of the number of turning points***

2.) Provide the information below for the following graph:



Domain:__________________ Range:_______________

Number of turns:___________ Minimum degree:________

Intervals of Increase:__________________________________

Intervals of decrease:_________________________________

What are the real roots?______________________________ Y intercept: ___________________________________

Absolute Maximum______________________________ Absolute minimum:________________________________

Relative Maximum ___________________________ Relative minimum: _________________________________

End Behavior: $x \to \infty, f(x) \to$ ___________________________

$x \to -\infty, f(x) \to$ ___________________________

3.) Determine the end behavior of the following polynomials:

a.) $f(x) = 2x^2 - 3x - 8$ $x \to \infty, f(x) \to$ ____________________
$x \to -\infty, f(x) \to$ ____________________

b.) $g(x) = -x^5 + 2x^3 - 5x$ $x \to \infty, f(x) \to$ ____________________
$x \to -\infty, f(x) \to$ ____________________

FINDING ROOTS

- ***Find possible rational roots (p/q's) p= all factors of the constant & q= all factors of the leading coefficient***
- ***Use the table of values or factor to find 1 root and then use synthetic division to get the polynomials down to a quadratic function so you can factor or do quadratic formula to find all roots***
- ***Number of roots will match the degree***

4.) List all the possible rational roots of the polynomial:
$f(x) = 2x^4 - 3x^2 + x - 8$

5) Find all roots of the polynomial: $f(x) = 2x^3 + 3x^2 - 59x - 30$

WRITING POLYNOMAILS FROM ROOTS

- ***Use roots to write the factors of the polynomial (factors and roots have opposite signs)***
- ***If "i" is a root then "-i" is also a root ; if $\sqrt{\#}$ is a root then -$\sqrt{\#}$ is also a root (even if not listed)***
- ***Multiply factors (using foil or distributive property) to get a polynomial in standard form***
- ***For root x= 3 + i, 3 – i; use the shortcut [x^2 – sumx + product] to get the trinomial***

Write a polynomial in standard form given the roots.

6) x = – 3, $\frac{-5}{4}$, 2

7) x = 4, $\sqrt{6}$

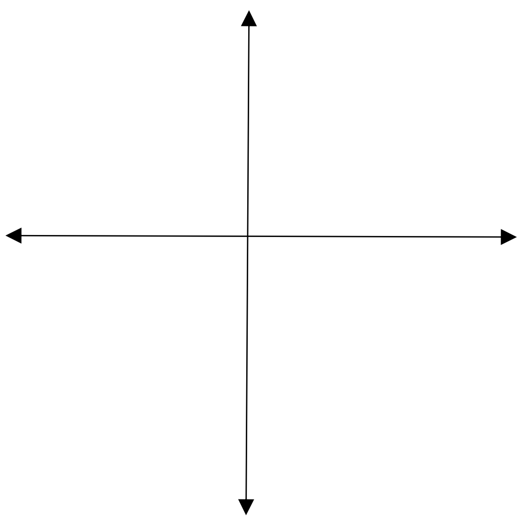
8) x= 5, 4 – i, 4 + i

SKETCHING GRAPHS

- ***Know how to sketch graphs from factored form and standard form (Factor to get into factored form)***
  - ***Multiplicity: exponent on the factor; helps you decide what the graph does at each zero; multiplicity of odds: crosses; multiplicity of even: bounces***
  - ***Odd degree/positive LC: ↓↑ ; Odd degree/negative LC: ↑↓***
  - ***Even degree/positive LC: ↑↑ ; Even degree/negative LC: ↓↓***
  - ***Number of turning points will be -1 from the degree, then -2 till you get to zero***
- ***Degree of the function in factored form: all multiplicities added together; Degree in standard form: highest exponent***

9.) Graph the polynomial function showing zeros, y-intercept, and end behavior. Identify the characteristics of the function:

$$f(x) = -x^2(x+4)(x-2)$$



Zeros	Multiplicity	Cross/Bounce.
________	________	________________
________	________	________________
________	________	________________

Y-intercept: ____________________

Degree of the polynomial: ______________________

Pos./Neg. Leading Coefficient? _________________

End Behavior: x → \ ∞ , f(x) → ____________

x → - ∞ , f(x) → _____________