

Name: \_\_\_\_\_

Algebra 2/Trig

## 6.1 – Graphs and Roots of a Polynomial

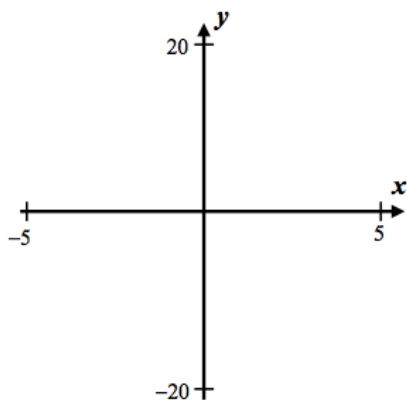
### SWBAT: Graph and find the roots of a polynomial

A polynomial is a function consisting of terms that all have whole number powers. In its most general form, a polynomial can be written as:

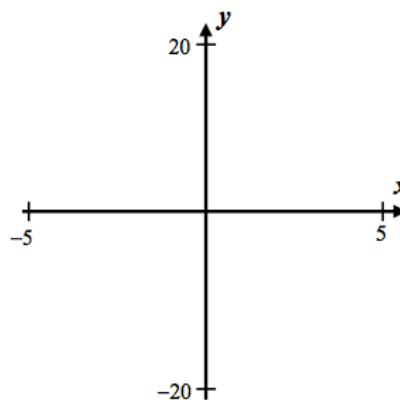
$$y = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$$

**Exercise #1:** For each of the following cubic functions, sketch the graph and circle its  $x$ -intercepts.

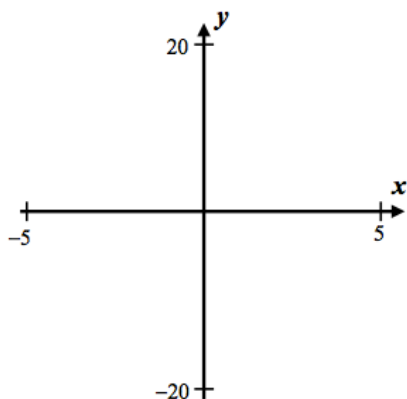
(a)  $y = x^3 - 3x^2 - 6x + 8$



(b)  $y = 2x^3 - 8x + 9$



(c)  $y = 2x^3 - 12x^2 + 18x$

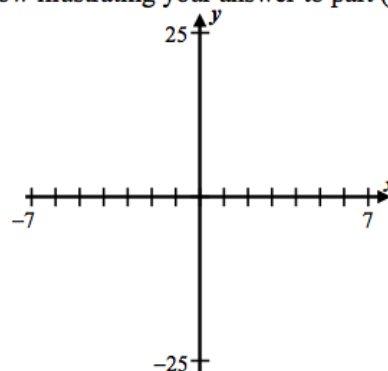


Clearly, a cubic may have one, two or three real roots and can have two turning points.

**Exercise #2:** Consider the cubic whose equation is  $y = x^3 - x^2 - 12x$ .

(a) Algebraically determine the zeros of this function.

(b) Sketch a graph of this function on the axes below illustrating your answer to part (a).



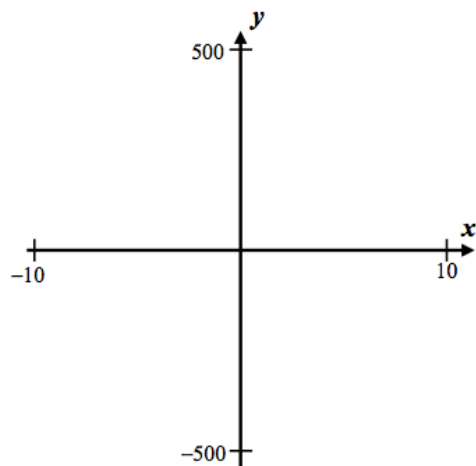
**Exercise #3:** The largest root of  $x^3 - 9x^2 + 12x + 22 = 0$  falls between what two consecutive integers?

- (1) 4 and 5                      (3) 10 and 11  
(2) 6 and 7                      (4) 8 and 9

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**Exercise #4:** Consider the quartic whose equation is  $y = x^4 + 3x^3 - 35x^2 - 39x + 70$ .

(a) Sketch a graph of this quartic on the axes below. Label its x-intercepts.

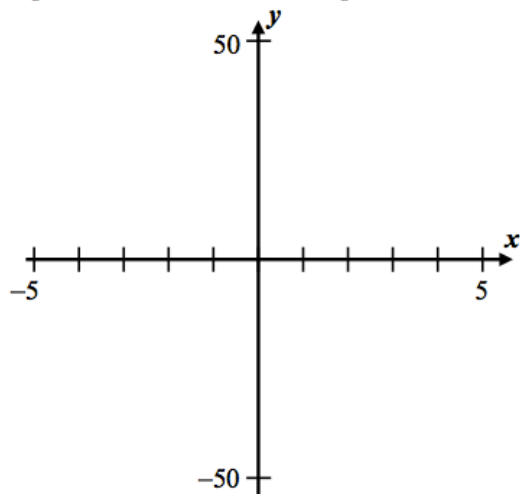


(b) Based on your graph from part (a), write the expression  $x^4 + 3x^3 - 35x^2 - 39x + 70$  in its factored form.

# Practice Problems

1. Consider the function  $y = x^3 + 3x^2 - 6x - 8$ .

(a) Sketch the function on the axes given. Clearly plot and label each  $x$ -intercept.

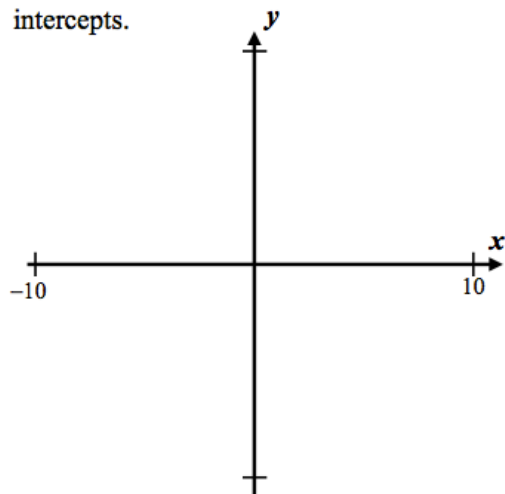


(b) Considering your answer to part (a), what values of  $x$  are solutions to the equation  $x^3 + 3x^2 - 6x - 8 = 0$ .

(c) Based on your answer to part (b), how must the expression  $x^3 + 3x^2 - 6x - 8$  factor?

2. Consider the cubic function  $y = x^3 + 2x^2 - 36x - 72$ .

(a) Find an appropriate  $y$ -window for the  $x$ -window shown on the axes and sketch the graph. Make the sure the window is sufficiently large to show the two turning points and all intercepts. Clearly label all  $x$ -intercepts.

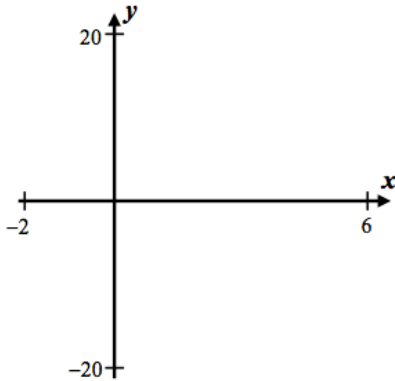


(b) What are the solutions to the equation  $x^3 + 2x^2 - 36x - 72 = 0$ ?

(c) How does the expression  $x^3 + 2x^2 - 36x - 72$  factor?

3. Consider the cubic function given by  $y = x^3 - 6x^2 + 12x - 5$ .

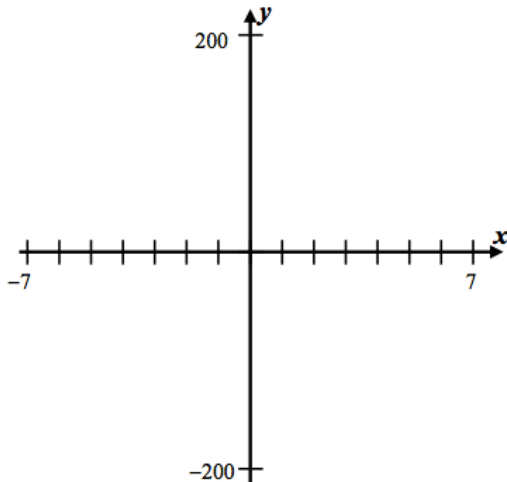
(a) Sketch a graph of this function on the axes given below.



(b) Considering the graphs of cubics you saw in class and those in problems 1 and 2, what is different about the way this cubic's graph looks compared to the others?

4. Consider the quartic function  $y = x^4 - x^3 - 27x^2 + 25x + 50$ .

(a) Sketch the graph of this function on the axes given below. Clearly mark all  $x$ -intercepts.



(b) Use your graph from part (a) to solve the equation  $x^4 - x^3 - 27x^2 + 25x + 50 = 0$ .

(c) Considering your answer to (b), how does the expression  $x^4 - x^3 - 27x^2 + 25x + 50$  factor?

5. In general, how does the number of zeros (or  $x$ -intercepts) relate to the highest power of a polynomial? Be specific. Can you make a statement about the minimum number of zeros as well as the maximum?