Before we begin, are there any questions from last day's work?

check the graphs from 2.3.3 and 2.5.3

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) verify the zeros of cubics and quartics are correct by graphing with technology
b) describe and sketch the graph of a polynomial function from its key properties (i.e. zeros, end behaviour, the shape of the graph)
c) expand the factored form of a function to verify it is the same as the function in standard form
d) connect the zeros of the function with the x-intercepts of the graph

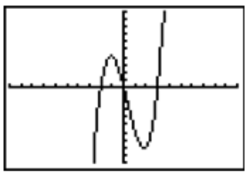
2.6.1: To Agree or Disagree…

Date: Mar. 5/18

Anticipation Guide

Instructions:

Check "Agree" or "Disagree" beside each statement *before* you start the task on BLM 2.6.2.
Compare your choice and explanation with a partner.
Revisit your choices after completing the task on BLM 2.6.2.
Compare the choices you made before the task and after the task.

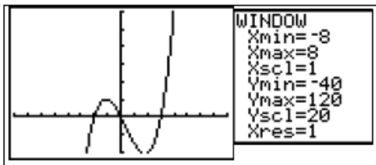
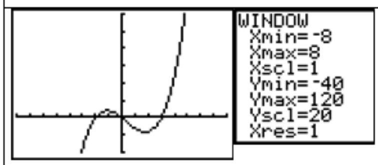
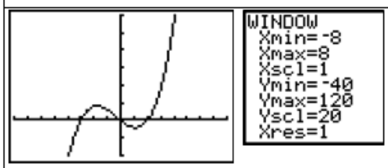
Before		Statement	After	
Agree	Disagree		Agree	Disagree
1	12	1. The x-intercepts of the function $y = 2(x + 1)(x - 3)(x - 4)$ are -1, 2, 3, 4.		15 ✓
16		2. If the end behaviour of a function is as $x \rightarrow \infty$, $y \rightarrow \infty$, the function has a positive leading coefficient.	✓16	
2	14	3. The function $y = 2(x - 1)(x + 2)(x - 3)$ has the same x-intercepts as $y = -5(x - 1)(x + 2)(x - 3)$.	✓16	
3	13	4. The function shown can be expressed in the form  $y = ax^4 + bx^3 + cx^2 + dx + e$		14 ✓
6	7	5. There are an infinite number of cubic functions that have x-intercepts of -2, 0, and 3.	16 ✓	
7	9	6. The zeros of the functions $y = x^4 - 5x^2 + 4$ and $y = (x+1)(x-1)(x+2)(x-2)$ are the same.	9 ✓	6

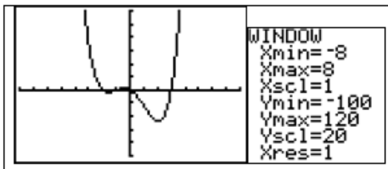
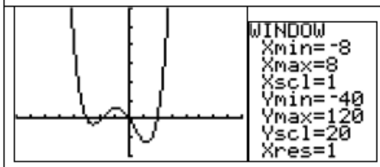
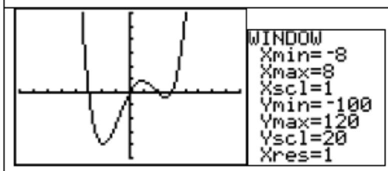
$y = (x^2 - 4)(x^2 - 1)$
$= (x-2)(x+2)(x-1)(x+1)$

2.6.2: "Expanding" Your Understanding of Functions

Date: ___________________

Student Instructions:In your groups, match the graph of the six functions given in the envelope with the zeros, end behaviour, and defining equation in factored form. *Optional*: Also match the defining equation in standard form.

Graph of Function	Zeros	End Behaviours	Defining Equation in Factored Form	Defining Equation in Standard Form (Optional)
	-2, 0, 3	as $x \to -\infty, y \to -\infty$ and as $x \to \infty, y \to \infty$	$y = 5x(x-3)(x+2)$	$y = 5x^3 - 5x^2 - 30x$
	-2, 0, 3	as $x \to -\infty, y \to -\infty$ and as $x \to \infty, y \to \infty$	$y = 2x(x-3)(x+2)$	$y = 2x^3 - 2x^2 - 12x$
	-3, 0, 2	as $x \to -\infty, y \to -\infty$ and as $x \to \infty, y \to \infty$	$y = 2x(x+3)(x-2)$	$y = 2x^3 + 2x^2 - 12x$

Graph of Function	Zeros	End Behaviours	Defining Equation in Factored Form	Defining Equation in Standard Form (Optional)
	-2, -1, 0, 3	as $x \to -\infty, y \to \infty$ and as $x \to \infty, y \to \infty$	$y = 2x(x+2)(x+1)(x-3)$	$y = 2x^4 - 14x^2 - 12x$
	-3, -2, 0, 2	as $x \to -\infty, y \to \infty$ and as $x \to \infty, y \to \infty$	$y = 2x(x+3)(x+2)(x-2)$	$y = 2x^4 + 6x^3 - 8x^2 - 24x$
	-3, 0, 2, 3	as $x \to -\infty, y \to \infty$ and as $x \to \infty, y \to \infty$	$y = 2x(x+3)(x-2)(x-3)$	$y = 2x^4 - 4x^3 - 18x^2 + 36x$

Ex. 1 (on next page)

Determining Equations of Polynomial Functions (using the roots and a point)

Ex. 1 a) Write the equation of the "family" of quadratic functions with zeros – 4 and 1.

b) Determine the equation of the "member of the family" that passes through (– 3, 2).

Solution (You've done these types of questions (with quadratics) in previous grades)

a) The "family" of quadratic functions with zeros – 4 and 1 is $y = a\,(x+4)(x-1)$.
All members of the same "family" will have the same zeros, but different values for "a",
and therefore different graphs (which are all vertical stretches or compressions of the graph if $a=1$.
Read page 208 in the text for examples, and nice colour sketches.

b) To determine the equation of the **SPECIFIC** "member of the family" that passes through (– 3, 2),
simply substitute the known value (– 3, 2) into the family equation, and solve for "a".

$$y = a(x+4)(x-1)$$

(x, y)

$$(2) = a\big((-3)+4\big)\big((-3)-1\big)$$

$$2 = a(1)(-4)$$

$$2 = -4a$$

$$\frac{2}{-4} = a$$

$$\therefore a = -\frac{1}{2}$$

and the equation is $y = \frac{-1}{2}(x+4)(x-1)$

You will use the same method for polynomial functions of degree 3 and 4.

Now **Read pp.209-211 (Ex. 1-3)**

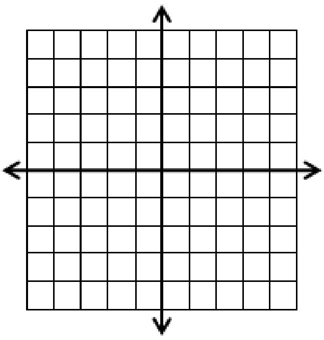
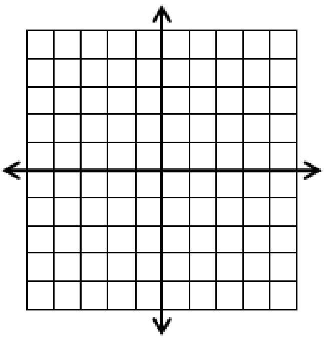
Then complete:

1) 2.6.3
2) pp.212-214 #8, 10, 14bcd, 16, 17(a-d)

2.6.3: Are There Any "*Standard*"'s Anymore?

Date: ___________________

1. Sketch any quartic function with x-intercepts of -3, -1, 1, and 2.

2. Sketch a second quartic function with the same x-intercepts and opposite end behaviour.

3. How many quartic functions have x-intercepts of -3, -1, 1, and 2?

4. A given cubic function has zeros at -2, 1 and 2.
   The general equation for such a function can be written as $y = a(x+2)(x-1)(x-2)$.
   If we let $a = 1$, then the equation becomes $y = (x+2)(x-1)(x-2)$.
   Suppose that the cubic passes through the point (3, 20). Determine the value of a.

5. For each of the following, determine the equation of the polynomial function.

a) Cubic with zeros at -3, -2 and 2 passing through (-4, 24).

b) Quartic with zeros at -3, -1, 1 and 3 passing through (2, -30).

c) Cubic with zeros at -2, -1 and 1 passing through (3, -120).

d) Quartic with zeros at -2, 1, 2 and 3 passing through (-1, 96).

e) Cubic with zeros at -1, -1, and 1 passing through (4, -150).

f) Quartic with zeros at -2, -2, 2 and 2 passing through (1, 27).