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

Today's Learning Goal(s):

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

a) make connections between a polynomial function in factored form and the x-intercepts of its graph
b) sketch the graph ofa polynomial function given in factored form using its **key features**
c) connect graphical and algebraic representations of cubic and quartic functio

If we were graphing a function, would the location of the zeros be enough to provide an accurate sketch of the function?

What other types of features would provide a more accurate sketch?

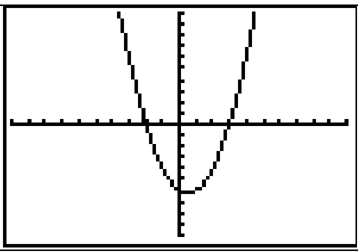
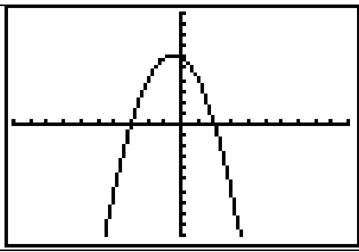
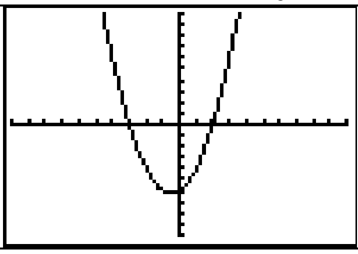
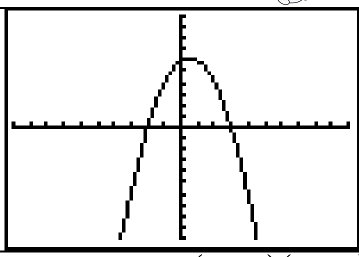
How could we determine those features using the algebraic representation of the function?

2.5.1: Remembering The Beloved Quadratic

Date: Sept. 28/18

Column A - Function In Standard Form	Column B - Function In Factored Form
$y=x^2+x-6$	$y=(x-3)(x+2)$
$y=x^2-x-6$	$y=-(x+3)(x-2)$
$y=-x^2-x+6$	$y=-(x-3)(x+2)$
$y=-x^2+x+6$	$y=(x+3)(x-2)$

1. Fill in the missing blanks below. Partner A works with the functions in standard form from column A. Partner B works with the functions in factored form from column B. Use desmos to graph your set of four functions. As a pair, determine the zeros of each graph.

	
Factored form $y=(x-3)(x+2)$	Factored form $y=-(x+3)(x-2)$
Standard form $y=x^2-x-6$	Standard form $y=-x^2-x+6$
Zeros are 3 and -2	Zeros are -3 and 2
	
Factored form $y=(x+3)(x-2)$	Factored form $y=-(x-3)(x+2)$
Standard form $y=x^2+x-6$	Standard form $y=-x^2+x+6$
Zeros are -3 and 2	Zeros are 3 and -2

2. If you did not have graphing software, would it be easier to identify the zeros of each quadratic function using factored form or standard form? (check one)

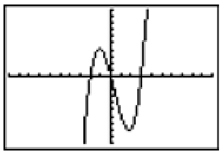
❒ standard form ☑ factored form

KEY FEATURES are used to sketch functions.
What KEY FEATURE did you use to match the graphs with their equations?

- sign of the leading coefficient
- the zeros

2.5.2: The *Key* to Graphing Cubics and Quartics

Date: Sept-28/18



1. Another KEY FEATURE of a graph is its end behaviour.

   Example: In the graph shown the end behaviour on the left is described as $x \to -\infty, y \to -\infty$ and the end behaviour on the right is described as $x \to \infty, y \to \infty$.

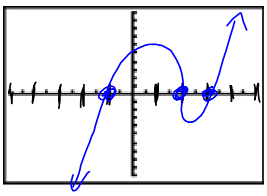
2. Use desmos to complete the following table. Sketch each function on the attached page.

	Equation	Degree	Type Of Polynomial	Zeros	Left Behaviour as $x \to -\infty, y \to$ (check one)	Right Behaviour As $x \to \infty, y \to$ (check one)
A)	$y=(x-2)(x-3)(x+1)$	3	cubic	2, 3, -1	☐ ∞ or ☑ $-\infty$	☑ ∞ or ☐ $-\infty$
B)	$y=-(x-2)(x-3)(x+1)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$
C)	$y=x(x+2)(x-1)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$
D)	$y=-x(x+2)(x-1)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$
E)	$y=(x-1)^2(x+2)$	3	cubic	1 order 2, -2	☐ ∞ or ☐ $-\infty$	☑ ∞ or ☐ $-\infty$
F)	$y=(x-1)(x-2)(x+3)(x-4)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$
G)	$y=-(x-1)(x-2)(x+3)(x-4)$	4	quartic	1, 2, -3, 4	☐ ∞ or ☑ $-\infty$	☐ ∞ or ☑ $-\infty$
H)	$y=x(x-2)(x+3)(x-4)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$
I)	$y=-x(x-2)(x+3)(x-4)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$
J)	$y=x(x+1)^2(x-3)$				☐ ∞ or ☐ $-\infty$	☐ ∞ or ☐ $-\infty$

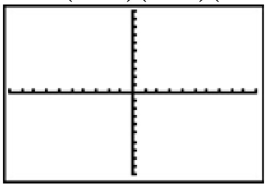
3. Compare and contrast the shapes of the cubic and quartic functions.

2.5.2: The *Key* to Graphing Cubics and Quartics (cont'd)

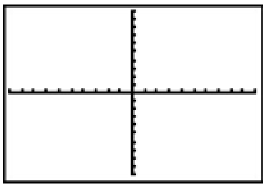
A) $y=(x-2)(x-3)(x+1)$



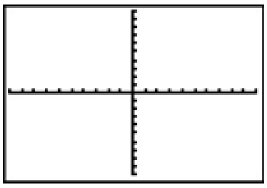
B) $y=-(x-2)(x-3)(x+1)$



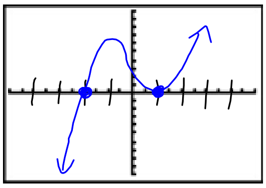
C) $y=x(x+2)(x-1)$



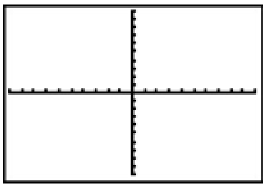
D) $y=-x(x+2)(x-1)$



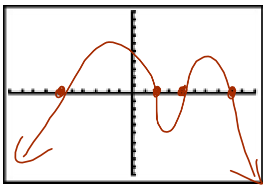
E) $y=(x-1)^2(x+2)$



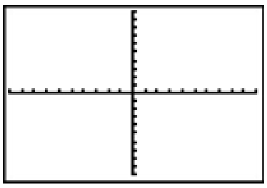
F) $y=(x-1)(x-2)(x+3)(x-4)$



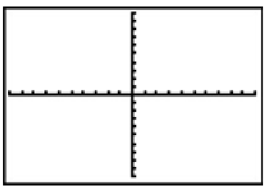
G) $y=-(x-1)(x-2)(x+3)(x-4)$



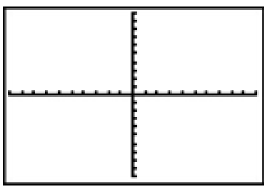
H) $y=x(x-2)(x+3)(x-4)$



I) $y=-x(x-2)(x+3)(x-4)$



J) $y=x(x+1)^2(x-3)$



2.5.1-2.5.3 Keys to Graphing Cubics and Quartics (Fall 2018)-f19-2 September 30, 2019

Today's work: *Complete 2.5.2 (both the chart and the sketch)*
Complete 2.5.3
Read p.208
Complete pp. 212-213 #5-7, 9, 11

Check some homework?

2.5.3: You Have the Key (features) to Sketching Graphs Date: Sept 28/18

List four KEY FEATURES that you can use to sketch a graph of a polynomial function.

1. degree of the polynomial function
2. zeros (and multiplicity of factors; i.e. order 2, 3, etc.)
3. sign of the leading coefficient
4. end behaviour

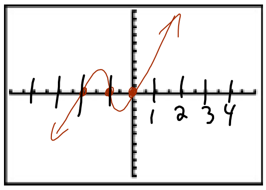
5. Factor where necessary. Determine the key features of each function.

a) $y = x^3 + 3x^2 + 2x$

$= x(x^2+3x+2)$

$0 = x(x+1)(x+2)$

$x=0$ $x=-1$ $x=-2$

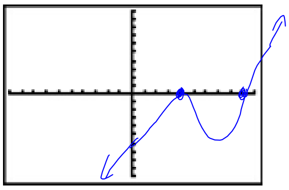


b) $y = (x-4)^2(x-9)$ degree: 3

$0=(x-4)^2(x-9)$

$x=4$ or $x=9$

(order 2)

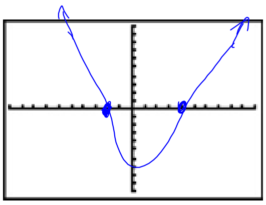


c) $y = x(x+2) - 4(x+2)$ lead coeff: +ve

degree: 2

$0=(x+2)(x-4)$

$x=-2$ or $x=4$

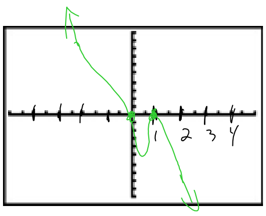


d) $y = -x(x-1)^2$ degree: 3

$0=-x(x-1)^2$

$x=0$ $x=1$

(order 2)



$-xA - 3A \rightarrow A(-x-3)$

e) $y = -x(2x+1) - 3(2x+1)$

$=(2x+1)(-x-3)$

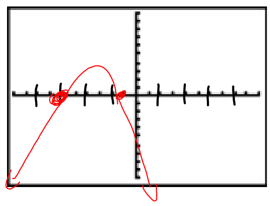
$=(2x+1)(-1)(x+3)$

$0=-1(2x+1)(x+3)$

$2x+1=0$ $x=-3$

$2x=-1$

$x=-\frac{1}{2}$



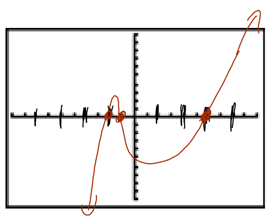
f) $y = x(2x^2-5x-3) + (2x^2-5x-3)$

$=(2x^2-5x-3)(x+1)$

$0=(2x+1)(x-3)(x+1)$

$2x+1=0$ $x-3=0$ $x+1=0$

$x=-\frac{1}{2}$ $x=3$ $x=-1$



6. Use the key features to *sketch* the graphs of the functions in question #5.
Also pp.212-213 #5-7, 9, 11

$$2x^2 - 5x - 3$$
$$= \underline{2x^2 + x} \underline{- 6x - 3}$$
$$= x(2x+1) - 3(2x+1)$$
$$= (2x+1)(x-3)$$

P: $2 \cdot 3 = 6$ S: -5

$1x \; {}^-6x$

$2 \quad 3$