GSE Advanced Algebra
September 25, 2015
Standards: MGSE9-12.F.IF.4 / MGSE9-12.F.IF.7 / MGSE9-12.F.IF.7c

Name_____

Graphs of Polynomial Functions NOTES

Finding the End Behavior of a function

Degree	Leading Coefficient	Graph Comparison		End Behavior
Even	Positive	$y = x^2$ 	Rise right Rise left	As $x \to +\infty$, $f(x) \to +\infty$ As $x \to -\infty$, $f(x) \to +\infty$
Even	Negative	$y = -x^2$ 	Fall right Fall left	As $x \to +\infty$, $f(x) \to -\infty$ As $x \to -\infty$, $f(x) \to -\infty$
Odd	Positive	$y = x^3$ 	Rise right Fall left	As $x \to +\infty$, $f(x) \to +\infty$ As $x \to -\infty$, $f(x) \to -\infty$
Odd	Negative	$y = -x^3$ 	Fall right Rise left	As $x \to +\infty$, $f(x) \to -\infty$ As $x \to -\infty$, $f(x) \to +\infty$

Turning Points

A polynomial function has a degree of ***n***.

Maximum Number of Turning Points = ***n* – 1**

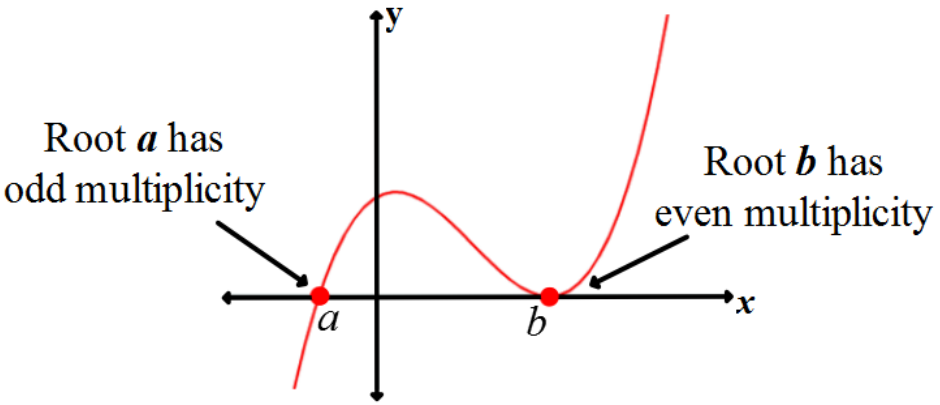
Steps for Graphing a Polynomial Function
1. Find the real zeros and *y*-intercept of the function.
2. Plot the *x*- and *y*-intercepts.
3. Make a table for several *x*-values that lie between the real zeros.
4. Plot the points from your table.
5. Determine the end behavior of the graph.
6. Sketch the graph.

Multiplicity

The **multiplicity** of root *r* is the number of times that $x - r$ is a factor of $P(x)$.

Odd Multiplicity
The graph of $P(x)$ crosses the *x*-axis.

Even Multiplicity
The graph of $P(x)$ touches the *x*-axis, but does not cross it. (*i.e. U-turn*)



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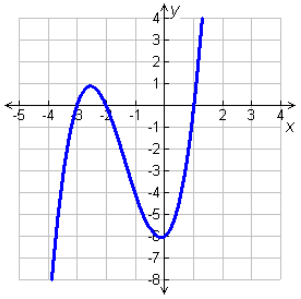
Complete the table to identify the leading coefficient, degree, and end behavior of each polynomial.

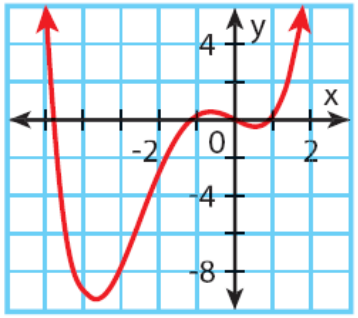
	Polynomial	Leading Coefficient	Degree	Graph Comparison	End Behavior
1.	$f(x) = 4x^7 + 5x^4 + 2$				
2.	$f(x) = -7x^6 + 2x^2 - 3x$				
3.	$f(x) = -2x^5 - x^3 + 6x$				

4. Identify whether each function graphed has an odd or even degree and a positive or negative leading coefficient.



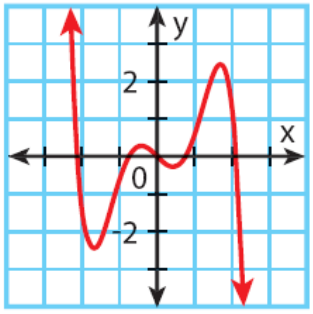
Degree:_____

Leading Coefficient:_____



Degree:_____

Leading Coefficient:_____



Degree:_____

Leading Coefficient:_____

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Equation	Solution (zeros)	*x*–int.	Multiplicity for each zero	Graph at *x*-axis **(*Use BOX 1*)**	End Behavior	Maximum number of turning points
#5 $P(x)=(x-1)^2(x-3)$					Degree = _____ Leading Coefficient = _____ Graph Comparison (circle one) $y=x^2$ / $y=-x^2$ / $y=x^3$ / $y=-x^3$ End Behavior **(*Use BOX 2*)**:_____	
#6 $P(x)=\frac{1}{12}(x+2)^2(x-3)^2$					Degree = _____ Leading Coefficient = _____ Graph Comparison (circle one) $y=x^2$ / $y=-x^2$ / $y=x^3$ / $y=-x^3$ End Behavior **(*Use BOX 2*)**:_____	
#7 $P(x)=x(x-3)(x+2)$					Degree = _____ Leading Coefficient = _____ Graph Comparison (circle one) $y=x^2$ / $y=-x^2$ / $y=x^3$ / $y=-x^3$ End Behavior **(*Use BOX 2*)**:_____	

BOX 1

Determine if the graphs do one of the following at the given *x*-intercepts.

A: The graph crosses the *x*-axis at the *x*-intercept. (ODD MULTIPLICITY)

B: The graph touches the *x*-axis and turns around at the *x*-intercept. (EVEN MULTIPLICITY)

BOX 2

End Behavior

C: As $x \to +\infty,\ f(x) \to +\infty$ (Rises Right)

D: As $x \to -\infty,\ f(x) \to +\infty$ (Rises Left)

E: As $x \to +\infty,\ f(x) \to -\infty$ (Falls Right)

F: As $x \to -\infty,\ f(x) \to -\infty$ (Falls Left)

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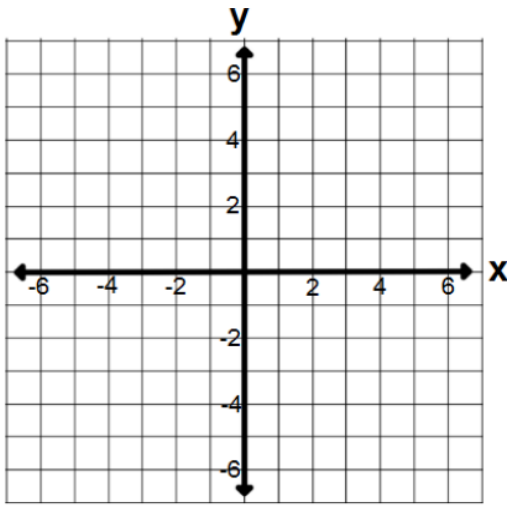
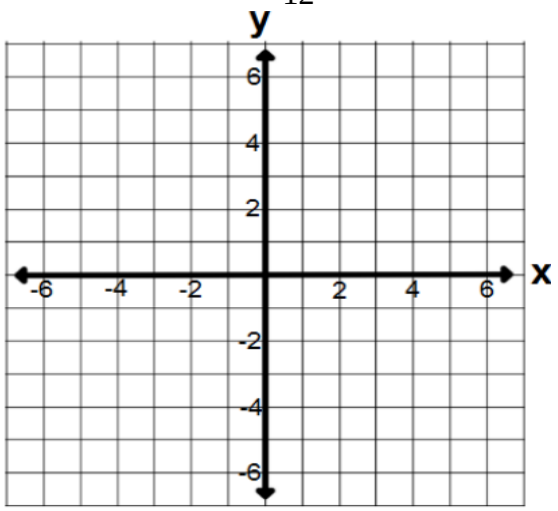
#5 Graph $P(x) = (x-1)^2(x-3)$



y-intercept

Additional Points

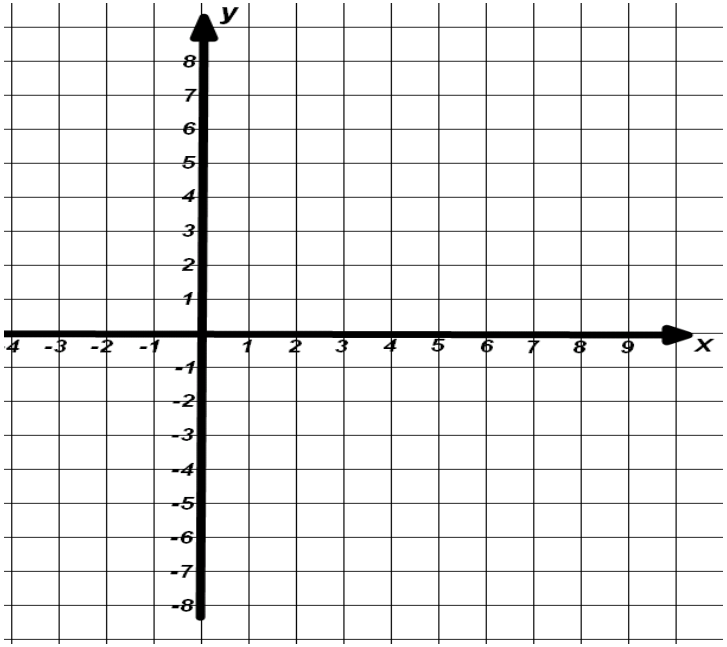
#6 Graph $P(x) = \frac{1}{12}(x+2)^2(x-3)^2$



y-intercept

Additional Points

#7 Graph $P(x) = x(x-3)(x+2)$



y-intercept

Additional Points