Algebra II: **Polynomial Functions** Name _____

Unit 4 Review Period _____ Date _____

Learning Target	Weight	Review Questions	**Do I Know It?** How will I prepare if I do not?
A-APR.B.3: Identify zeroes of polynomials when suitable factorizations are available, and use the zeroes to construct a rough graph of the function defined by the polynomial. **Embedded A-APR.2, F-IF.7c*	3	1 – 5	
A-REI.D.11: Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.	1	6 – 10	
F-IF.B.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: domain and range, intercepts; intervals where the function is increasing, decreasing, positive, or negative, and symmetries. **Embedded F-IF.7c*	2	11 – 14	
F-IF.C.9: Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has a larger maximum. **Embedded F-BF.3, F-IF.6*	2	15 – 19	

Algebra II: **Polynomial Functions**
Unit 4 Review

Name _____
Period _____ Date _____

A.APR.3 Learning Target: I *can sketch a graph of the polynomial using the zeroes and end behavior*

1. Given the function $f(x) = -x^3 + 4x^2 - 4x$

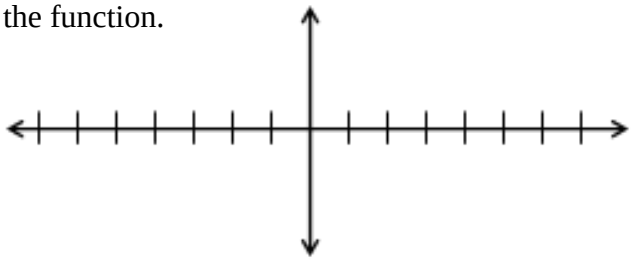
Part A: Identify the zeroes of the function.

Part B: Describe the end behavior of the function.

$x \to \infty,\ f(x) \to$ _____

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

Part C: Use this information to sketch the graph of the function.



2. Given the function $p(x) = x^4 - 9x^3 + 22x^2 - 32$

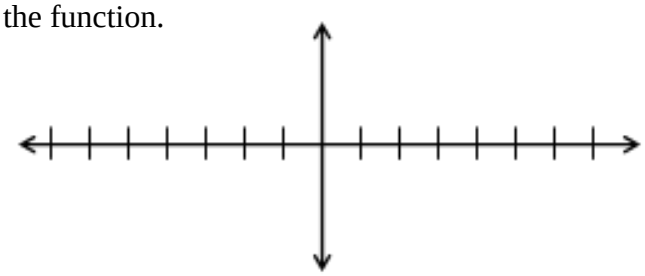
Part A: Identify the zeroes of the function.

Part B: Describe the end behavior of the function.

$x \to -\infty,\ p(x) \to$ _____

$x \to \infty,\ p(x) \to$ _____

Part C: Use this information to sketch the graph of the function.

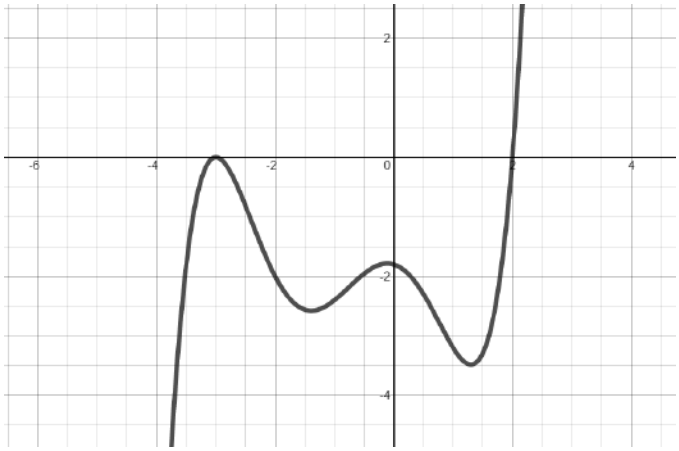


Useful Links/Videos for this Standard

Graphing polynomials
http://www.coolmath.com/algebra/22-graphing-polynomials

End Behavior of Polynomials
https://www.khanacademy.org/math/algebra2/polynomial-functions/polynomial-end-behavior/v/polynomial-end-behavior
https://www.youtube.com/watch?v=y78Dpr9LLN0&feature=youtu.be%2F

3. The graph below is a polynomial function.



Part A: Choose ALL true statement about the polynomial graphed.

(a) The function is a 3rd degree (cubic) polynomial.
(b) The function is 4th degree (quartic)
(c) The function is 5th degree (quantic)
(d) The leading coefficient is negative.
(e) One of the real roots is $x = 2$.
(f) One of the real roots is $x = -2$.
(g) One of the roots has multiplicity 2.
(h) Two of the roots have multiplicity 2.

Part B: Complete the statement: The polynomial function above has _____ imaginary roots.

Using synthetic division to find roots
https://www.youtube.com/watch?v=D_I11k2DfCg
https://www.youtube.com/watch?v=paq5VWwXHp8
Graphing and Roots
https://www.youtube.com/watch?v=e_EttLeQblY

4. Given the function $b(x) = 2x^3 - 3x^2 - 9x + 10$

Part A: Use synthetic division to show that $(x + 2)$ is a factor of the function b. Show all work

Part B: Identify the zeroes of the function.

Part C: Rewrite the polynomial in factored form.

5. Given the function $q(x) = x^3 - 4x^2 - 11x + 30$.

Part A: Is $(x - 3)$ a factor of $q(x)$? Explain.

Part B: Identify the zeroes of the function q.

Part C: Rewrite the polynomial in factored form.

A.REI.11 Learning Target: *I can identify the points of intersection of two or more functions.*
Useful Links/Videos for this Standard
http://www.rasmus.is/uk/t/F/Su52k03.htm
http://www.instructables.com/id/How-to-Find-the-Intersecting-Points-of-Two-Functio/

6. ***Part A:*** Create a table with x, $f(x)$ and $g(x)$ and then identify the points of intersection of the functions. $f(x) = x^4 + 2x^2 - 4$

$g(x) = x^5 - x^3 - 4$

x	$f(x)$	$g(x)$
-3		
-2		
-1		
0		
1		
2		
3		

Part B: Explain why a table may not be the best way to find the points of intersection of two functions.

7. Use a graphing calculator to find the approximate intersection(s) to the nearest tenth.

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

$q(x) = x^4 - 4x^2 + 3x$

8. Use a graphing calculator to find the approximate intersection(s) to the nearest tenth.

$A(x) = x^3 + 3x^2 - 9$

$B(x) = x^2 + 2x - 8$

9. Justin is at the range shooting flying discs to practice shooting at moving objects. The height in meters of a disc **t** seconds after launch is modeled by the equation $H(t) = -5t^2 + 32t + 2$. The path of Justin's bullet (with the same units) is modeled by the equation $B(t) = 31.5t + 1$. A physicist graphs the two equations and finds two solutions: (-0.4, -11.6) and (0.5, 16.75). Explain why one solution is irrelevant and what the second solution means in terms of the given situation.

10. The revenue (in thousands of dollars) for a company producing flying drones is given by $R(x) = -20x^2 + 50x + 2$, where x is the number of drones manufactured and sold. The cost of drone production is given as $C(x) = -x^3 + 20x^2 - 10x + 25$. Company analysts find three solutions to this system and decide (18.89, 232.89) is the most financially feasible. Explain the meaning of the point of intersection.

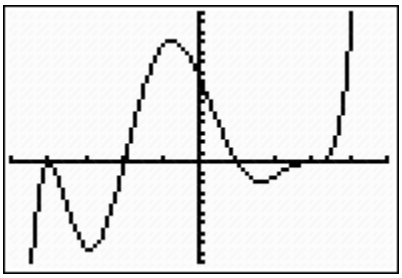
F.IF.4 Learning Target: *I can interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship*

Useful Links/Videos for this Standard

https://www.khanacademy.org/math/algebra/algebra-functions/positive-negative-increasing-decreasing-intervals/v/increasing-decreasing-positive-and-negative-intervals

http://www.coolmath.com/precalculus-review-calculus-intro/precalculus-algebra/11-graphing-increasing-decreasing-01

11. The graph below is $k(x)$. ***Part A:*** Identify the roots and their multiplicities to fill in the table below



Root	Multiplicity

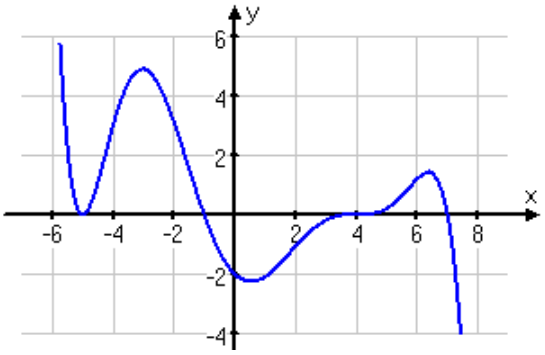
Part B: Fill in the correct bubble to describe the given interval of the graph as constant, increasing or decreasing.

Interval	Constant	Increasing	Decreasing
$(-\infty, -4)$	○	○	○
$(-3, -1)$	○	○	○
$(-1, 1)$	○	○	○
$(3, \infty)$	○	○	○

Part C: Fill in the correct bubble to describe the given interval of the graph as positive or negative.

Interval	Positive ($y > 0$)	Negative ($y < 0$)
$x < -2$	○	○
$-2 < x < 1$	○	○
$1 < x < 3$	○	○
$x > 3$	○	○

12. The graph below is $M(x)$. ***Part A:*** Identify the roots and their multiplicities to fill in the table below



Root	Multiplicity

Part B: Label each point as a minimum or maximum.

Point	Minimum	Maximum
(– 5, 0)	○	○
(– 3, 5)	○	○
(0.5, 2.1)	○	○
(6.5, 1.5)	○	○

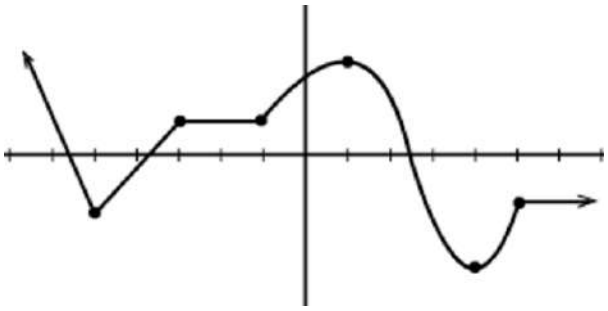
Part C: Fill in the correct bubble to describe the given interval of the graph as positive or negative.

Interval	Positive (y > 0)	Negative (y < 0)
(– 5, – 1)	○	○
(7, ∞)	○	○

Part B: Fill in the correct bubble to describe the given interval of the graph as constant, increasing or decreasing.

Interval	Constant	Increasing	Decreasing
$-2 < x < 0$	○	○	○
$x > 7$	○	○	○

13. The graph below is $w(x)$.



Part A: Fill in the correct bubble to describe the given interval of the graph as constant, increasing or decreasing.

Interval	Constant	Increasing	Decreasing
$(-\infty, -5)$	○	○	○
(– 3, – 1)	○	○	○
(– 1, 1)	○	○	○
(5, ∞)	○	○	○

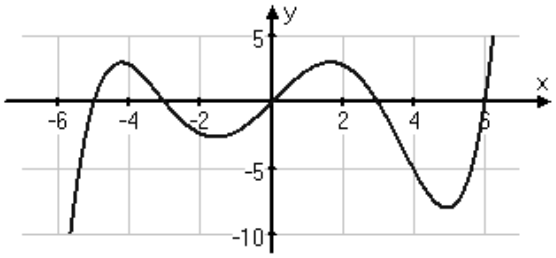
Part B: Fill in the correct bubble to describe the given interval of the graph as positive or negative.

Interval	Positive (y > 0)	Negative (y < 0)
$x < -2$	○	○
$-2 < x < 1$	○	○
$1 < x < 3$	○	○
$x > 3$	○	○

Part C: Label each point as a minimum or maximum.

Point	Minimum	Maximum
$x = -5$	○	○
$x = 1$	○	○
$x = 4$	○	○

14. Choose ALL true statement about the polynomial graphed.



(a) The domain of the function is $(-\infty, \infty)$

(b) The range of the function is $(-\infty, \infty)$

(c) The domain of the function is $[-7, \infty)$

(d) The range of the function is $[-7, \infty)$

(e) Relative maximum occurs at (- 4.1, 3)

(f) Relative minimum occurs at (0, 0)

(g) Relative minimum occurs at (5, - 8)

(h) There are two relative maximums

(i) There are two relative minimums

(j) There is an absolute minimum

(k) The function is increasing on interval (-4, 0)

(l) The function is decreasing on interval (2, 4)

(m) There are two increasing intervals

(n) There are two decreasing intervals

(o) *as* $x \to \infty$, $y \to \infty$

(p) *as* $x \to -\infty$, $y \to \infty$

(q) The polynomial is degree 3 (cubic)

(r) The polynomial is degree 4 (quartic)

(s) The polynomial is degree 5 (quintic)

(t) The leading coefficient is negative.

F.IF.9 Learning Target: *I can compare properties of two functions each represented in a different way.*

Useful Links/Videos for this Standard

https://www.varsitytutors.com/high_school_math-help/transformations-of-polynomial-functions

https://www.khanacademy.org/math/algebra2/manipulating-functions/stretching-functions/e/shifting_and_reflecting_functions

see also previous standard's links

15. The function $y = x^3$ is transformed to:

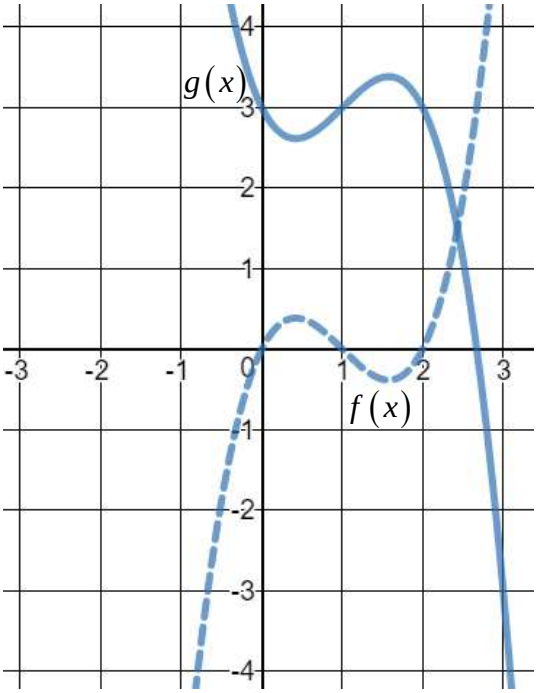
Part A: $f(x) = 5x^3 - 8$ Describe in words how the function has been transformed:

Part B: $g(x) = -x^3 + 4$. Describe in words how the function has been transformed.

Part C: $p(x) = \frac{1}{2}(x-2)^3$. Describe in words how the function has been transformed.

Part D: $q(x) = (x+4)^3 - 7$. Describe in words how the function has been transformed.

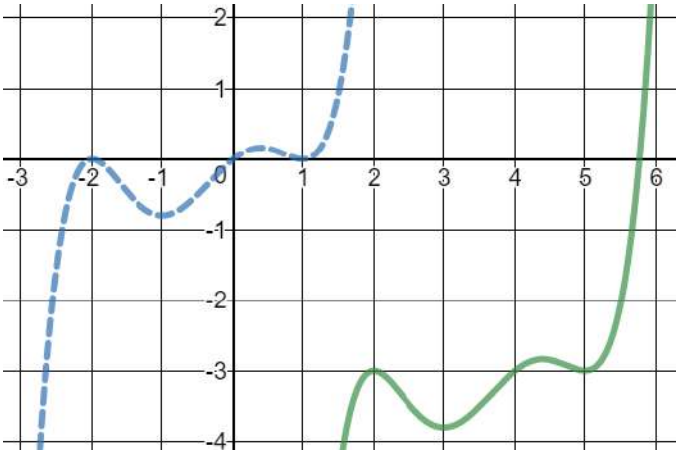
16. The parent function $f(x)$ is translated to $g(x)$.



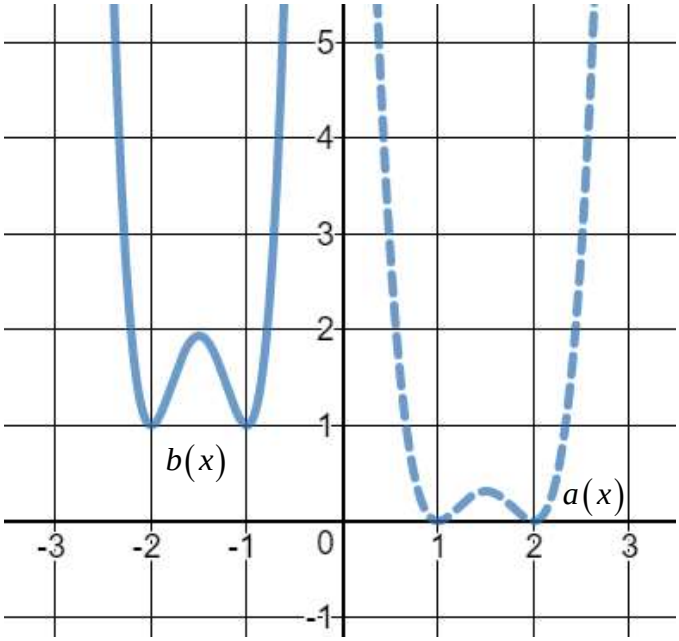
Select all transformations that apply.

(a) Reflected over the x-axis
(b) Vertically stretched by a factor of 2
(c) Vertically compressed by a factor of ⅓
(d) Vertical shift up 3 units
(e) Vertical shift down 2 units
(f) Horizontal shift left 2 units
(g) Horizontal shift right 1 unit

17. If the dotted graph is $f(x)$, how would you write its transformation to the solid graph?



The parent function $a(x)$ is translated to $b(x)$.



Select all transformations that apply.

(a) Reflected over the x-axis
(b) Vertically stretched by a factor of 3
(c) Vertically compressed by a factor of ⅕
(d) Vertical shift up 1 unit
(e) Vertical shift down 2 units
(f) Horizontal shift left 3 units
(g) Horizontal shift right 4 units

Choices for #17

[A] $f(x-3)+4$

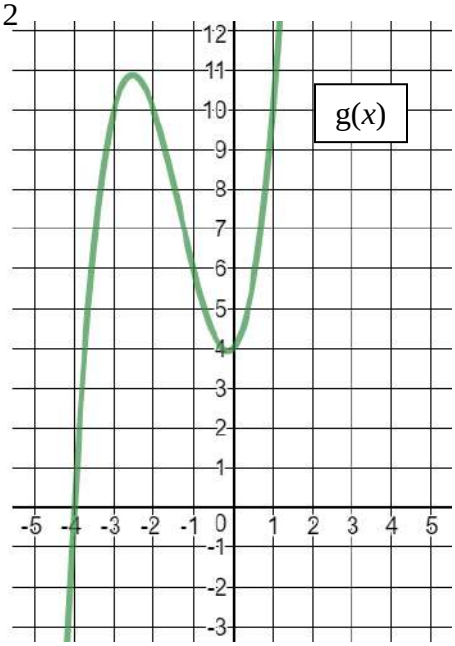
[B] $f(x+3)-4$

[C] $f(x-4)-3$

[D] $f(x+4)-3$

18. Examine the functions below, fill out the chart and answer the questions.

$f(x) = 3x^2 + 6x - 2$



	$f(x)$	$g(x)$
Number of real x-intercepts		
value of largest x-intercept		
Minimum value		
Maximum value		
Absolute minimum		
Absolute maximum		

Which function has an increasing rate of change over the interval $(-\infty, -3)$?

Which function has a decreasing rate of change over the interval $(-2, 0)$?

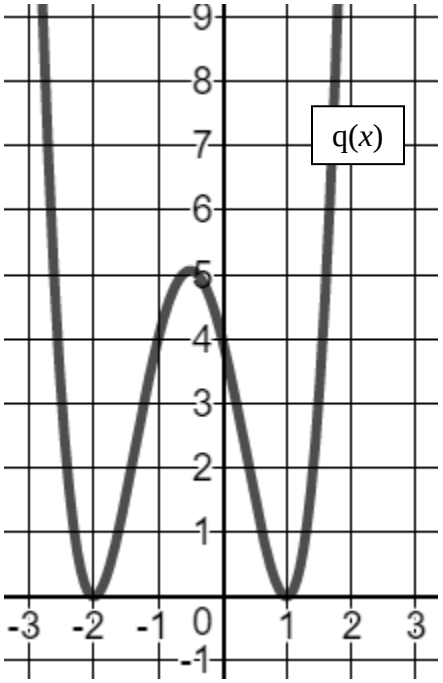
What is the indicated end behavior?

$x \to \infty,\ f(x) \to$ _____

$x \to \infty, g(x) \to$ _____

19. Examine the functions below, fill out the chart and answer the questions.

$p(x) = -x^2 - 4$



	$p(x)$	$q(x)$
Number of real x-intercepts		
value of smallest x-intercept		
Minimum value		
Maximum value		
Degree of function		
Number of imaginary roots		

Which function has an increasing rate of change over the interval $(-2, 0)$?

Which function has a decreasing rate of change over the interval $(1, \infty)$?

What is the indicated end behavior?

$x \to -\infty,\ p(x) \to$ _____

$x \to -\infty, q(x) \to$ _____