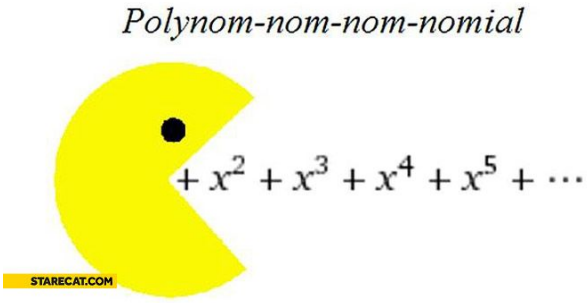
Name _____

Math 3 Honors Unit 2: Polynomials



Monday	Tuesday	Wednesday	Thursday	Friday
February 4 ● Polynomial long division HW: worksheet 2.1	**February 5** ● Synthetic division ● Remainder and Factor Theorems HW: worksheet 2.2	**February 6** ● Zeroes and multiplicity ● End behavior HW: worksheet 2.3	**February 7** ● Function analysis HW: worksheet 2.4	**February 8** ● QUIZ!! ● Transformations of polynomial functions HW: worksheet 2.5
February 11 ● Solve polynomial equations HW: worksheet 2.6	**February 12** ● Write polynomials from roots ● Applications HW: worksheet 2.7	**February 13** ● Average rates of change HW: worksheet 2.8	**February 14** ● Review HW: finish review	**February 15** ● Early Release ● TEST!!

2.1 - Polynomial Long Division

For #1−6, divide.

1. $(x^3 + 13x^2 + 39x + 20) \div (x + 9)$

2. $(4n^3 - 13n - 6) \div (2n + 1)$

3. $(x^3 + 5x^2 - 2x - 24) \div (x^2 + 7x + 12)$

4. $(3x^2 + 5x^3 - 5x + 3) \div (x - 1)$

5. $(10a^4 - a^3 + 11a^2 + 7a + 5) \div (5a^2 + 2a - 1)$

6. $(6m^4 + 4m^3 - 13m^2 - 10m - 5) \div (2m^2 - 5)$

7. One factor of $4x^3 + 15x^2 - 31x - 30$ is $x - 2$. Completely factor $4x^3 + 15x^2 - 31x - 30$.

8. Two factors of $12a^4 - 39a^2 + 8a - 8a^3 + 12$ are $a - 2$ and $2a + 1$. Find the other factors.

9. When $10x^3 + mx^2 - x + 10$ is divided by $5x - 3$, the quotient is $2x^2 + nx - 2$ and the remainder is 4. Find the values for *m* and *n*.

2.2 - Synthetic Division

Divide.

1. $(2x^3 - 3x^2 - 4x + 5) \div (x + 1)$

2. $(2x^4 - 5x^3 + 2x^2 + 5x - 10) \div (x - 2)$

3. $(8x^2 - 26x - 9) \div (x - 7)$

4. $(6x^2 - 26x + 37) \div (2x - 4)$

5. $(9x^3 + 18x^2 - 4x) \div (x + 2)$

6. $(x^4 - 2x^3 - 70x + 20) \div (x - 5)$

7. $(x^6 - 4x^3 - 42) \div (x - 1)$

8. $(x^3 - 4x^2 + 9) \div (x - 3)$

Use the Remainder and Factor Theorems.

9. What is the remainder when $3x^3 + 10x^2 + x - 6$ is divided by $x + 3$?

10. Is $x - 2$ a factor of $4x^2 + 13x + 10$? Explain how you know.

11. Determine the remainder when $5x^8 + 3x^2 - 2$ is divided by $x + 8$.

12. Is $x - 3$ a factor of $7x^4 - 9x$? Explain how you know.

Find the zeroes using the given information.

13. Find all the zeroes of $f(x) = x^3 - 4x^2 + x + 6$ given that $x + 1$ is a factor.

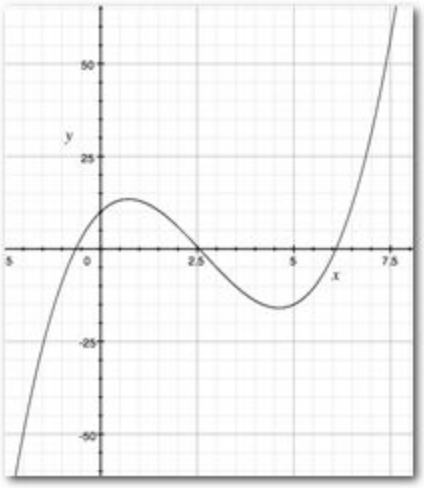
14. Solve for all the solutions of $2x^3 - 5x^2 + x + 2 = 0$ given that 2 is a solution.

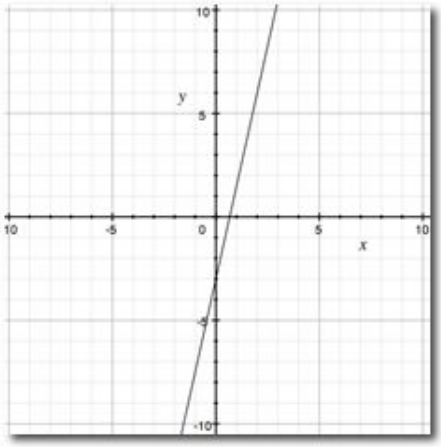
15. Find all the zeroes of $g(x) = 2x^3 + 3x^2 + 8x + 12$ if $-\frac{3}{2}$ is a root.

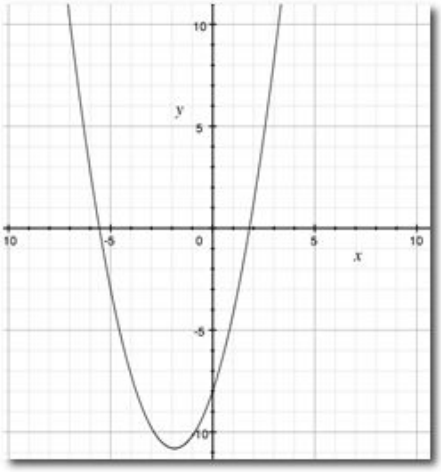
2.3 - Zeroes and End Behavior

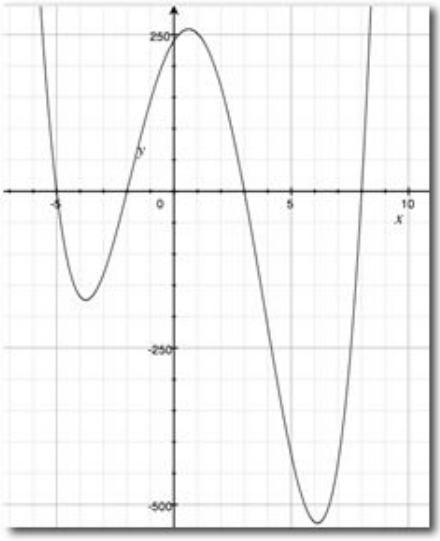
This worksheet consists of 6 graphs, 6 functions, 6 descriptions of end behavior, and 6 descriptions of the roots. Match each function to its graph, root description and end behavior description.

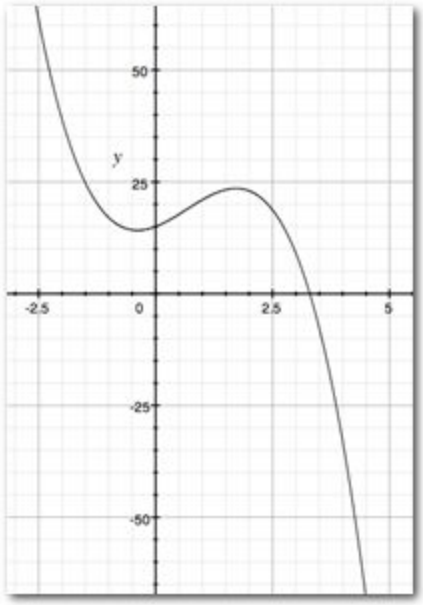
1. $f(x) = .8x^2 + 3x - 8$
2. $f(x) = 4.5x - 3$
3. $f(x) = -2x^5 + 4x^4 + 3x^3 - 5x^2 + 6x + 20$
4. $f(x) = (x+2)(x-3)(x+5)(x-8)$
5. $f(x) = x^3 - 8x^2 + 10x + 10$
6. $f(x) = -2x^3 + 4x^2 + 4x + 15$

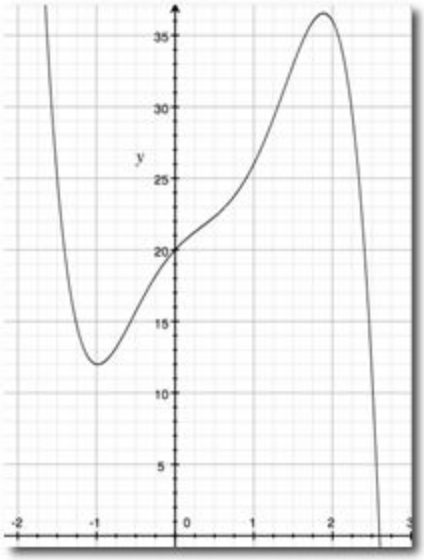












4 real roots	3 real roots	1 real roots, 2 imaginary roots
1 real root, 4 imaginary roots	1 real root	2 real roots

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

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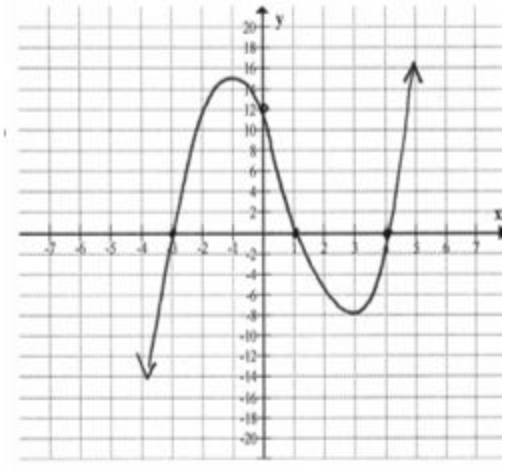
2.4 - Function Analysis

Fill in the missing information.

Polynomial Function	Classification by Degree	Classification by Terms	End Behavior
1. $f(x) = 3x^2 - 5$			
2. $y = -x^4 + 6x - 1$			
3. $g(x) = 6x$			
4. $h(x) = 5x^2 - 2x^3 + 7x - 3$			

Identify the zeroes of each function below. Be sure to state any multiplicity. Then state the intervals over which the function is increasing and decreasing.

5.



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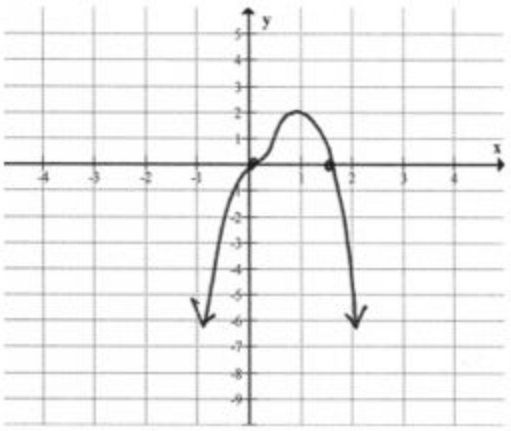

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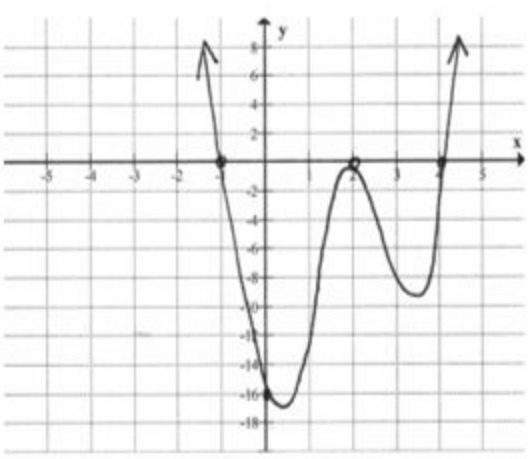

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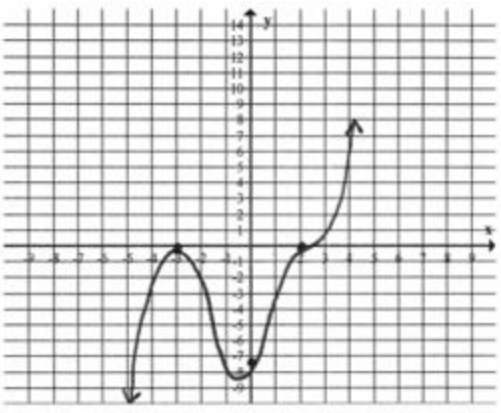

Use the given information to complete the missing columns.

<table>
<tr><th>Table of Values</th><th>Graph</th><th>Key Features of Function</th></tr>
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<tr><th>x</th><th>y</th></tr>
<tr><td>−3</td><td>6</td></tr>
<tr><td>−2</td><td>0</td></tr>
<tr><td>−1</td><td>−4</td></tr>
<tr><td>0</td><td>−6</td></tr>
<tr><td>1</td><td>−6</td></tr>
<tr><td>2</td><td>−4</td></tr>
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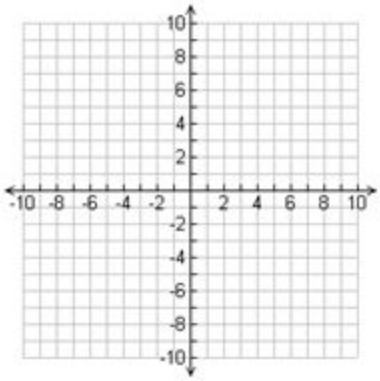
<td> 
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<tr><th>x</th><th>y</th></tr>
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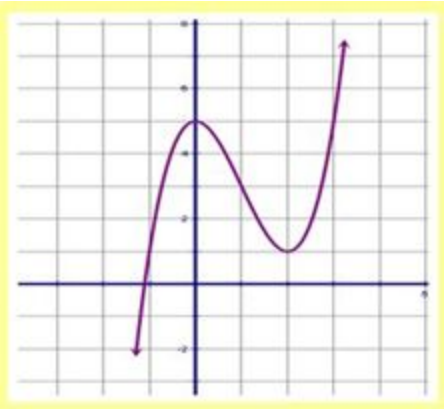
<td>  </td>
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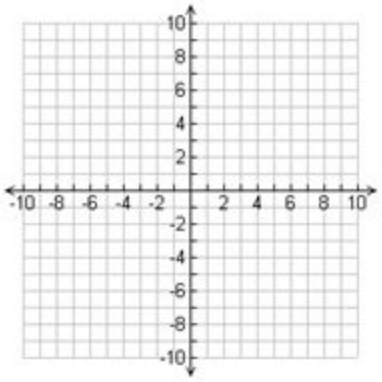
x	y



The y-intercept is $(0, 7)$. The zeroes are located at $x = 4$ and $x = 7$. There is a relative minimum at $(-5.5, 1.5)$ and at $(5.5, -2.5)$. A relative maximum is located at $(-1, 8.5)$. The polynomial is quartic.

2.5 - Transformations of Polynomial Functions

For #1 − 4, describe the transformations that would produce the graph of the second function from the graph of the first function.

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

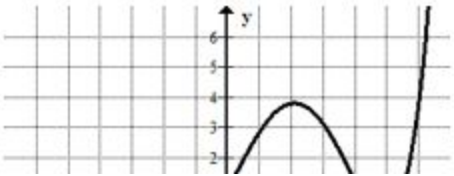
2. $f(x) = x^3$ becomes $f(x) = -3x^3 - 1$

3. $f(x) = x^4$ becomes $f(x) = \frac{1}{2}(x+1)^4 - 3$

4. $f(x) = x^2$ becomes $f(x) = -2(3x-2)^2 + 5$

5. Write the equation for the graph of function $g(x)$, obtained by shifting the graph of $f(x) = x^2$ three units left, stretching the graph vertically by a factor of two, reflecting that over the x-axis, and then translating the graph four units up.

6. Write the equation for the graph of function $g(x)$, obtained by shifting the graph of $f(x) = x^4$ two units right and four units up.



7. Determine the zeroes and their multiplicity, the end behavior, the points of extrema, the intervals over which the function is increasing and decreasing, and the intervals over which the function is positive and negative.

2.6 - Solve Polynomial Equations

Solve for x.

1. $x^4 - 5x^2 - 36 = 0$

2. $x^3 - 2x^2 + 3x - 6 = 0$

3. $x^3 + 3x^2 - 14x - 20 = 0$

4. $x^3 - 5x^2 + 2 = 4x$

5. $x^3 + 27 = 0$

6. $x^2 = x$

2.7 - Applications of Polynomials

1. At the ruins of Caesarea, archaeologists discovered a huge hydraulic concrete block with a volume of 945 cubic meters. The block's dimensions are x meters high by $12x - 15$ meters long by $12x - 21$ meters wide. What is the height of the block?

2. You are designing a chocolate mold shaped like a hollow rectangular prism for a candy manufacturer. The mold must have a thickness of 1 cm in all dimensions. The mold's outer dimensions should also be in the ratio 1:3:6. What should the outer dimensions of the mold be if it is to hold 112 cubic centimeters of chocolate?

3. A manufacturer wants to build a rectangular stainless steel tank with a holding capacity of 670 gallons, or about 89.58 cubic feet. The tank's walls will be one half inch thick and about 6.42 cubic feet of steel will be used for the tank. The manufacturer wants the outer dimensions of the tank to be related as follows:

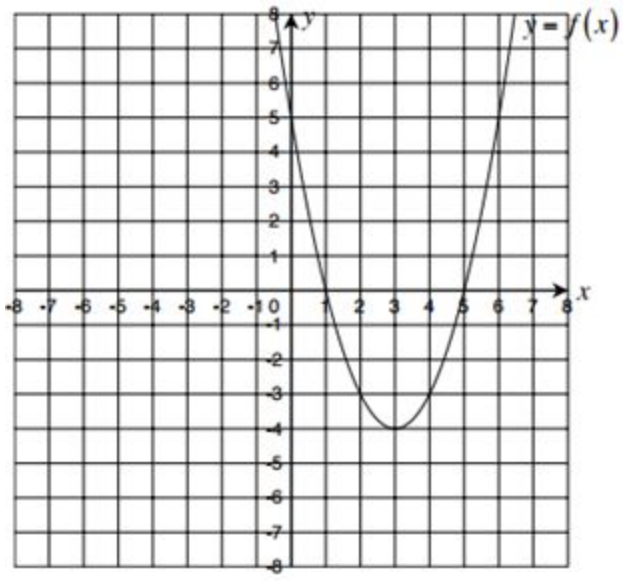
- The width should be 2 feet less than the length
- The height should be 8 fee more than the length

What should the outer dimensions of the tank be?

4. From 1985 to 2003, the total attendance A (in thousands) at NCAA women's basketball games and the number T of NCAA women's basketball teams can be modeled by and where x is the number of years since 1985. Compare and contrast the two functions. Find the attendance and number of teams for the year 1998.

5. Suppose you have 250 cubic inches of clay with which to make a sculpture shaped as a rectangular prism. You want the height and width each to be 5 inches less than the length. What should the dimensions of the prism be if you want to use all of your clay?

2.8 - Average Rate of Change



1. Find the average rate of change from $x = 1$ to $x = 2$

2. Find the average rate of change from $x = 3$ to $x = 6$

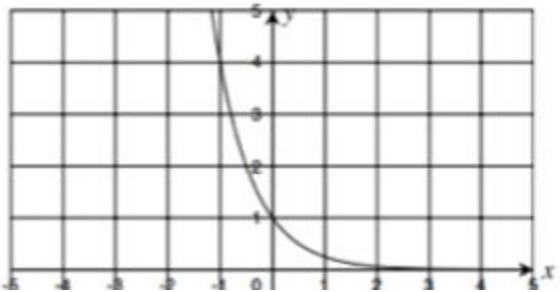
3. Find the average rate of change from $x = 2$ to $x = 4$

Find the average rate of change for the following function over the given interval. What does the average rate of change tell you about the function on the interval?

4. from $x = 0$ to $x = 3$

x	0	1	2	3	4
$f(x)$	3	6	12	24	48

5. from $x = -1$ to $x = 1$



6. In general as $x \to \infty$, which function eventually grows at the fastest rate?

a. $a(x) = 3x$ b. $b(x) = x^3$ c. $c(x) = 3^x$