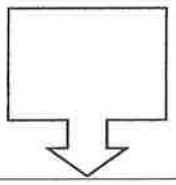
Name _____

Honors Math III – Unit 2 – Polynomial Functions



Date	Lesson/Objective	Homework
Wed. Sept. 13	***Introduction to Polynomials***	2-1 #1-15
Thurs. Sept. 14	***Sketch Polynomial Functions***	2-1 #16 – 33 , 36-39, 41-46
Friday Sept. 15	***More Sketching of Poly. Functions and Multiplicity***	2-2
Monday Sept. 18	***Factor Polynomials and Find zeroes of Poly. Equations***	2-3
Tuesday Sept. 19	***Division of Polynomials***	2-4
Wed. Sept. 20	**Remainder and Factor Theorem** **Unit 2 Quiz 2**	2-5
Thurs. Sept. 21	**Workday**	OFF!!!!!
Friday Sept. 22	**Find zeros of a polynomial Equations**	2-6
Mon. Sept. 25	**Find more zeroes of Poly. Equations** **Unit 2 Quiz 2**	2-7
Tuesday Sept. 26	***APPLICATIONS***	2-8
Wed. Sept. 27	***Review for Unit 2 Test***	Complete Review WS
Thurs. Sept. 28	**Test on Unit 2**	

HW 2-1 5-1

Name _____ Class _____ Date _____

Practice

Form G

Polynomial Functions

Write each polynomial in standard form. Then classify it by degree and by number of terms.

1. $4x + x + 2$
2. $-3 + 3x - 3x$
3. $6x^4 - 1$
4. $1 - 2s + 5s^4$
5. $5m^2 - 3m^2$
6. $x^2 + 3x - 4x^3$
7. $-1 + 2x^2$
8. $5m^2 - 3m^3$
9. $5x - 7x^2$
10. $2 + 3x^3 - 2$
11. $6 - 2x^3 - 4 + x^3$
12. $6x - 7x$
13. $a^3(a^2 + a + 1)$
14. $x(x + 5) - 5(x + 5)$
15. $p(p - 5) + 6$
16. $(3c^2)^2$
17. $-(3 - b)$
18. $6(2x - 1)$
19. $\frac{2}{3} + s^2$
20. $\frac{2x^4 + 4x - 5}{4}$
21. $\frac{3 - z^5}{3}$

Determine the end behavior of the graph of each polynomial function.

22. $y = 3x^4 + 6x^3 - x^2 + 12$
23. $y = 50 - 3x^3 + 5x^2$
24. $y = -x + x^2 + 2$
25. $y = 4x^2 + 9 - 5x^4 - x^3$
26. $y = 12x^4 - x + 3x^7 - 1$
27. $y = 2x^5 + x^2 - 4$
28. $y = 5 + 2x + 7x^2 - 5x^3$
29. $y = 20 - 5x^6 + 3x - 11x^3$
30. $y = 6x + 25 + 4x^4 - x^2$

Describe the shape of the graph of each cubic function by determining the end behavior and number of turning points.

31. $y = x^3 + 4x$
32. $y = -2x^3 + 3x - 1$
33. $y = 5x^3 + 6x^2$

Determine the degree of the polynomial function with the given data.

34.

x	y
−2	−16
−1	1
0	4
1	5
2	16

35.

x	y
−2	52
−1	6
0	2
1	4
2	48

HW 2-1

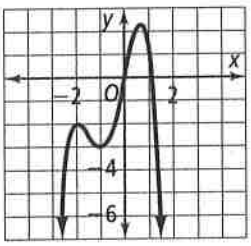
Name _____ Class _____ Date _____

5-1 **Practice** (continued) *Form G*

Polynomial Functions

Determine the sign of the leading coefficient and the degree of the polynomial function for each graph.

36.



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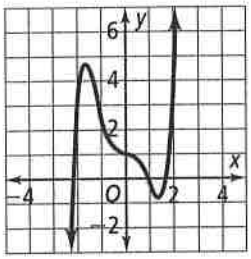
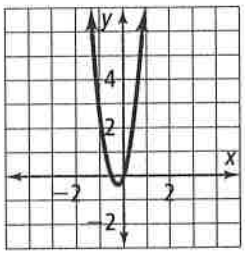


38.



39. Error Analysis A student claims the function $y = 3x^4 - x^3 + 7$ is a fourth-degree polynomial with end behavior of down and down. Describe the error the student made. What is wrong with this statement?

40. The table at the right shows data representing a polynomial function.

a. What is the degree of the polynomial function?

b. What are the second differences of the y-values?

c. What are the differences when they are constant?

x	y
−3	−999
−2	−140
−1	−7
0	0
1	1
2	116
3	945

Classify each polynomial by degree and by number of terms. Simplify first if necessary.

41. $4x^5 - 5x^2 + 3 - 2x^2$

42. $b(b - 3)^2$

43. $(7x^2 + 9x - 5) + (9x^2 - 9x)$

44. $(x + 2)^3$

45. $(4s^4 - s^2 - 3) - (3s - s^2 - 5)$

46. 13

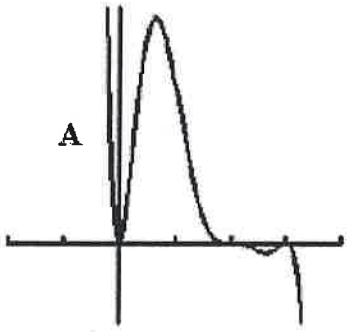
47. Open-Ended Write a third-degree polynomial function. Make a table of values and a graph.

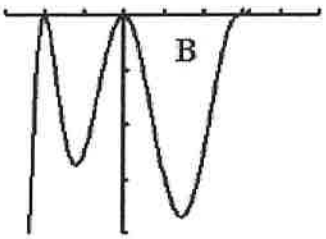
48. Writing Explain why finding the degree of a polynomial is easier when the polynomial is written in standard form.

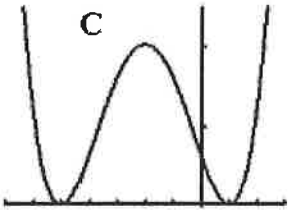
HW 2-2 → 2 pages

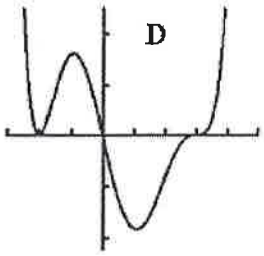
Using the given equation in the table, fill in the rest for each example. Lastly, match each polynomial to its correct graph shown below. The first one is done for you. **Some of them don't have matches!**

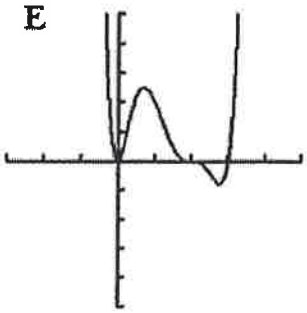
Equation	Graph	Degree	(Root, multiplicity)
$y = x(x+2)^2(x-3)^3$	D	6	x = 0, m = 1 | x = -2, m = 2 | x = 3, m =
$y = x^2(x+2)^2(x-3)^3$			
$y = (x+5)^2(x-1)$			
$y = (x+5)^2(x-1)^2$			
$y = -(x-1)^3(x+1)\ \ (x+2)$			
$\boldsymbol{y = (x-1)^3(x+1)\ \ (x-2)}$			
$y = (x-4)^2(x+3)^2$			
$y = -(x-4)^2(x+3)^2$			
$y = x^2(x-2)^3(x-3)$			
$y = -x^2(x-2)^3(x-3)^2$			

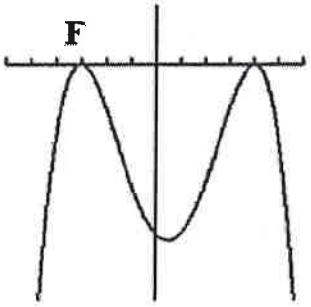


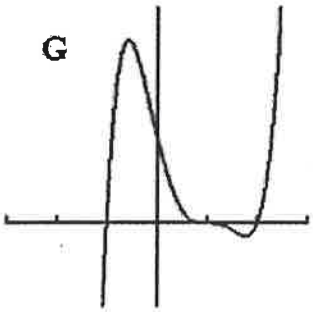


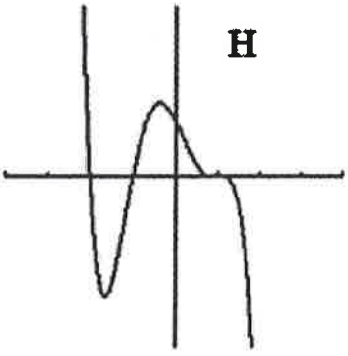


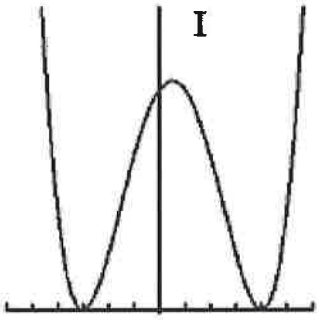


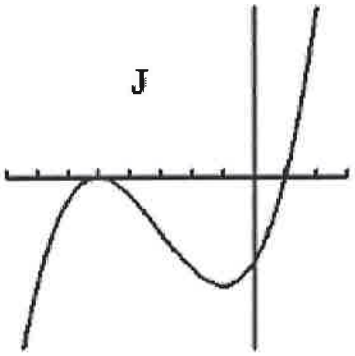












HW 2-2 Cont

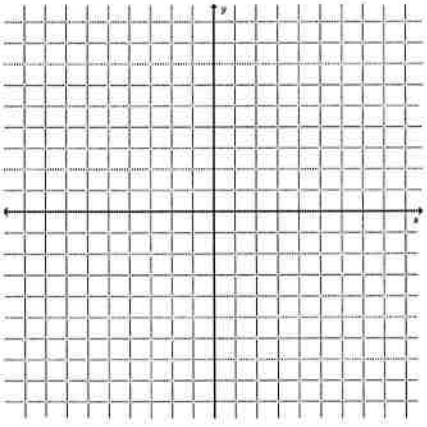
Describe the zeros, multiplicity, and end behavior of the graph of each function.

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

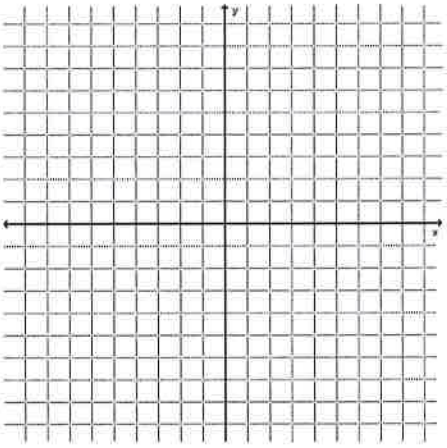
2. $y = x^2(x-1)(x+3)$

Sketch the graph of the polynomial based on the end behavior, zeros, and multiplicity.

3. $y = -(x+4)^2(x-2)$



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



Name _____ Class _____ Date _____

5-3 Practice

Form G

Solving Polynomial Equations

HW 2-3

Show All work on notebook paper!

Find the real or imaginary solutions of each equation by factoring.

1. $8x^3 - 27 = 0$
2. $x^3 + 64 = 0$
3. $2x^3 + 54 = 0$
4. $2x^3 - 250 = 0$
5. $4x^3 - 32 = 0$
6. $27x^3 + 1 = 0$
7. $64x^3 - 1 = 0$
8. $x^3 - 27 = 0$
9. $x^4 - 5x^2 + 4 = 0$
10. $x^4 - 12x^2 + 11 = 0$
11. $x^4 - 10x^2 + 16 = 0$
12. $x^4 - 8x^2 + 16 = 0$
13. $x^4 - 9x^2 + 14 = 0$
14. $x^4 + 13x^2 + 36 = 0$
15. $x^4 - 10x^2 + 9 = 0$
16. $x^4 + 3x^2 - 4 = 0$

Find the real solutions of each equation by graphing.

17. $2x^4 = 9x^2 - 4$
18. $x^2 - 16x = -1$
19. $6x^3 + 10x^2 + 5x = 0$
20. $36x^3 + 6x^2 = 9x$
21. $15x^4 = 11x^3 + 14x^2$
22. $x^4 = 81x^2$

For Exercises 23 and 24, write an equation to model each situation. Then solve each equation by graphing.

23. The volume V of a container is 84 ft^3. The width, the length, and the height are x, $x + 1$, and $x - 4$ respectively. What are the container's dimensions?

24. The product of three consecutives integers $n - 1$, n, and $n + 1$ is -336. What are the integers?

Name _____ Class _____ Date _____

5-4 Practice

Form G

Dividing Polynomials

HW 2-4

Show work on Notebook paper!

Divide using long division. Check your answers.

1. $(x^2 - 13x - 48) \div (x + 3)$
2. $(2x^2 + x - 7) \div (x - 5)$
3. $(x^3 + 5x^2 - 3x - 1) \div (x - 1)$
4. $(3x^3 - x^2 - 7x + 6) \div (x + 2)$
5. $(x^2 - 3x + 1) \div (x - 4)$
6. $(x^3 - 4x^2 + 3x + 2) \div (x + 2)$

Determine whether each binomial is a factor of $x^3 + 3x^2 - 10x - 24$.

7. $x + 4$
8. $x - 3$
9. $x + 6$
10. $x + 2$

Divide using synthetic division.

11. $(x^3 - 8x^2 + 17x - 10) \div (x - 5)$
12. $(x^3 + 5x^2 - x - 9) \div (x + 2)$
13. $(-2x^3 + 15x^2 - 22x - 15) \div (x - 3)$
14. $(x^3 + 7x^2 + 15x + 9) \div (x + 1)$
15. $(x^3 + 2x^2 + 5x + 12) \div (x + 3)$
16. $(x^3 - 5x^2 - 7x + 25) \div (x - 5)$
17. $(x^4 - x^3 + x^2 - x + 1) \div (x - 1)$
18. $(2x^4 + 7x^3 - 11x^2 + 21x + 5) \div (x + 5)$
19. $(x^4 - 5x^3 + 5x^2 + 7x - 12) \div (x - 4)$
20. $(2x^4 + 23x^3 + 60x^2 - 125x - 500) \div (x + 4)$

Use synthetic division and the given factor to completely factor each polynomial function.

21. $y = x^3 + 3x^2 - 13x - 15; (x + 5)$
22. $y = x^3 - 3x^2 - 10x + 24; (x - 2)$
23. $y = x^3 + x^2 - 10x + 8; (x - 1)$
24. $y = x^3 + 4x^2 - 9x - 36; (x + 3)$
25. The expression $V(x) = x^3 - 13x + 12$ represents the volume of a rectangular safe in cubic feet. The length of the safe is $x + 4$. What linear expressions with integer coefficients could represent the other dimensions of the safe? Assume that the height is greater than the width.

Use synthetic division and the Remainder Theorem to find $P(a)$.

26. $P(x) = 3x^3 - 4x^2 - 5x + 1; a = 2$
27. $P(x) = x^3 + 7x^2 + 12x - 3; a = -5$
28. $P(x) = x^3 + 6x^2 + 10x + 3; a = -3$
29. $P(x) = 2x^4 - 9x^3 + 7x^2 - 5x + 11; a = 4$

HW 2-5

Show ALL work on Notebook Paper!

Divide using long division

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

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

3) $9x^3 + 18x^2 - 4x - 10 \div x + 2$

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

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

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

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

8) $(4x^4 + 5x^3 + 2x^2 - 1) \div (x + 1)$

Use the Remainder Theorem

1) Is $(x - 1)$ a factor of $x^3 + 2x^2 - 2x - 1$?

2) Is $(x + 2)$ a factor of $4x^2 + 13x + 10$?

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

4) Is $(x - 2)$ a factor of $4x^2 + 13x + 10$?

5) What is the remainder when $3x^3 + 10x^2 + x - 6$ is divided by $x - 1$?

Find the zeros using the given information

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

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

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

HW 2-6

Use the Remainder Theorem to find out if the divisor is a factor. If not, what is the remainder?

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

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

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

4) $x^5 - 2x^4 + 3x^2 - 20x + 3 \div (x + 1)$

Use the Rational Zeros Theorem to a) write a list of all potential zeros, b) use the Remainder Theorem to determine which ones, if any, are zeros, and c) find remaining zeros.

5) $y = x^3 - 9x^2 + 28x - 30$

6) $y = x^4 + x^3 + 2x^2 + 4x - 8$

Use your calculator to find a zero of the given polynomial. Then, find the remaining roots.

7) $y = 2x^3 - 3x^2 - 14x + 15$

8) $y = -3x^3 + 20x^2 - 36x + 16$

11) $y = 3x^3 - x^2 - 5x + 3$

12) $y = x^3 - 6x^2 + 4x + 16$

HW 2-7

Finding Zeros Practice

Now it's time to practice. Fill in the table. Follow the example provided.
Graph each polynomial function on your calculator. You may need to change your window to get a "good" picture. Sketch the graph. Write the degree of the function and find the number of real zeros (number of x-intercepts). Using synthetic division and your real zeros, find all the zeros of the function. Remember once you have a quadratic expression and you can factor or use the quadratic formula to solve.

Function	Degree	# Of Zeros	Graph	# Of Real Zeros	List of All Zeros
1. $f(x)=x^3-3x^2+x-3$					
3. $f(x)=x^3-4x^2-7x+10$					
4. $g(x)=x^4-x^3+2x^2-4x-8$					
5. $f(x)=x^3+3x^2-4x-6$					

HW 2-7 cont

Function	Degree	# Of Zeros	Graph	# Of Real Zeros	List of All Zeros
6. $h(x)=x^4+2x^3-5x^2-4x+6$					
7. $g(x)=x^3+6x^2-6x-36$					
9. $f(x)=x^3+8$					
10. $f(x)=x^4-x^3+9x^2-9x$					

Polynomial Word Problems Practice and Homework

Hw 2-8
2 pages

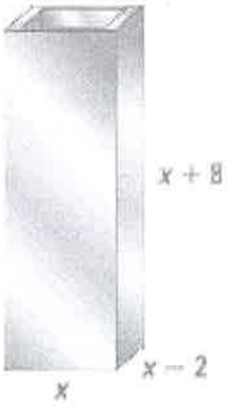
Name _____

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?
   (HINT: Volume of steel = Volume outside – volume inside)



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 $A = -1.95x^3 + 70.1x^2 - 188x + 2150$ and $T = 14.8x + 725$ 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.

2-8 cont

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?

6. The price p (in dollars) that a radio manufacturer is able to charge for a radio is given by $p = 40 - 4x^2$ where x is the number of radios produced in millions. It costs the company $15 to make a radio.

   a) Write an expression for the company's total revenue in terms of x
   b) Write a function for the company's profit P by subtracting the total cost to make x radios from the expression in part a
   c) Currently the company produces 1.5 million radios and makes a profit of $24,000,000. What lesser number of radios can the company produce to make the same profit?

7. **CHALLENGE**: The profit P (in millions of dollars) for a DVD manufacturer can be modeled by $P = -6x^3 + 72x$ where x is the number of DVDs produced (in millions). Show that 2 million DVDs is the only production level for the company that yields a profit of $96,000,000.

8. A platform shaped like a rectangular prism has dimensions (x – 2) feet by (3 – 2x) feet by (3x + 4) feet. Explain why the volume of the platform cannot be 7/3 cubic feet.