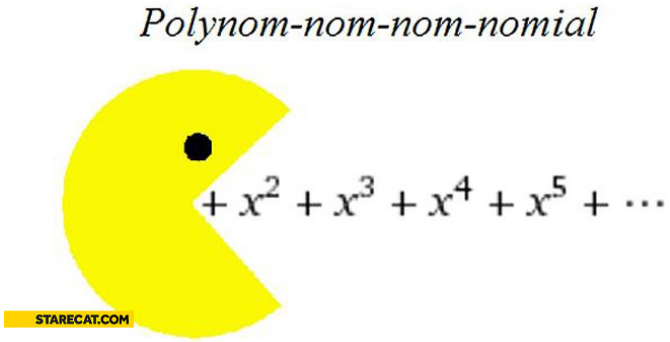
Name _____

Math 3 Unit 2: Polynomial Functions



February 4 ● Polynomial long division HW: 2.1	**February 5** ● Synthetic division ● Remainder and factor theorems HW: 2.2	**February 6** ● Classify polynomials ● Zeroes and multiplicity HW: 2.3	**February 7** ● Extrema ● Intervals for increasing and decreasing HW: 2.4	**February 8** ● QUIZ!! ● End behavior ● Intervals for positive and negative HW: 2.5
February 11 ● Solve polynomial equations HW: 2.6	**February 12** ● Applications ● Rates of change HW: 2.7	**February 13** ● Review for test HW: finish review	**February 14** ● TEST!!!	

2.1 - Polynomial Long Division

Simplify using polynomial long division. Remember that terms must be descending order and you must have every exponent down from the highest exponent.

1. $(3x^2 - 13x - 10) \div (x - 5)$

2. $(2x^3 + 8x^2 + 6x - 7) \div (2x + 4)$

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

4. $(12x^3 + 6 + 11x - 7x^2) \div (3x + 2)$

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

6. $(-4x^2 - 4x^3 - 5 + 9x) \div (2x - 1)$

2.2 - Synthetic Division

When possible, simplify using synthetic division. Remember that terms must be descending order and you must have every exponent down from the highest exponent. HINT: 2 of these problems require long division!!

1. $(3x^3 + 11x^2 - 6x - 18) \div (x + 4)$

2. $(2x^3 - 13x^2 - 77x + 60) \div (x - 10)$

3. $(x^3 - 20) \div (x - 3)$

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

5. $(2x^3 + 62x - 26x^2 + 4) \div (2x - 6)$

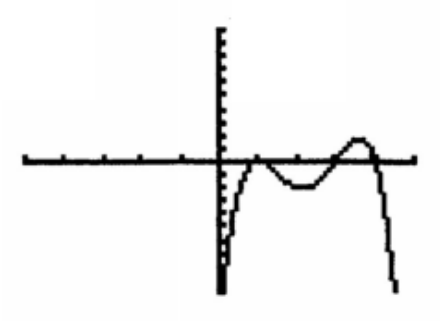
6. $(2x^3 - 11x^2 + 9x - 20) \div (x - 5)$

7. $(5x^4 + 2x^2 - 15x) \div (x + 2)$

8. $(-18x + 3x^3 + 9 + 6x^2) \div (3x - 3)$

2.3 - Zeroes and Multiplicity

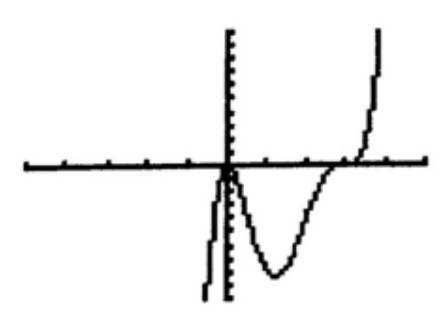
For each graph and equation, state the zeroes and their multiplicity. Then state the smallest possible degree.

1. 

zeroes: _____

_____

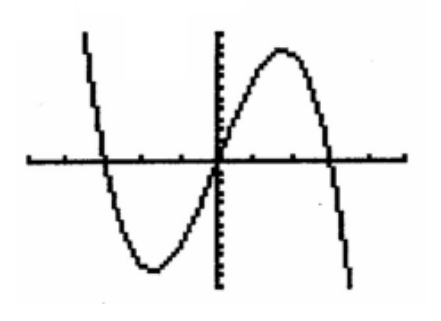
degree: _____

2. 

zeroes: _____

_____

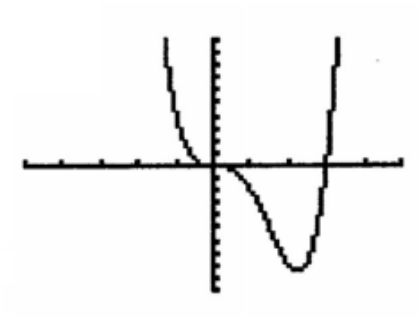
degree: _____

3. 

zeroes: _____

_____

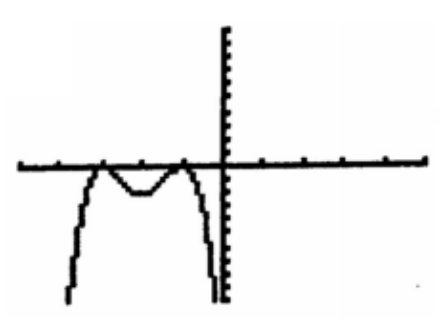
degree: _____

4. 

zeroes: _____

_____

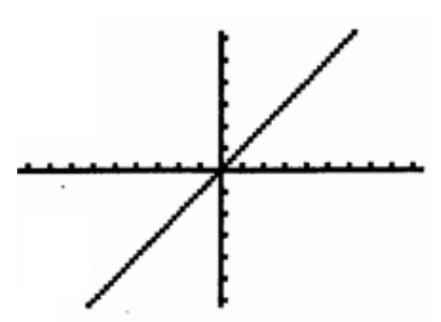
degree: _____

5. 

zeroes: _____

_____

degree: _____

6. 

zeroes: _____

_____

degree: _____

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

zeroes: _____

degree: _____

8. $f(x) = (2x-1)(x+4)$

zeroes: _____

degree: _____

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

zeroes: _____

degree: _____

10. $f(x) = 5(x-6)^2(x+1)(x-4)$

zeroes: _____

degree: _____

11. $f(x) = 4x^2(2x+3)^4(x-10)$

zeroes: _____

degree: _____

12. $f(x) = x^{15}(x-4)^{20}$

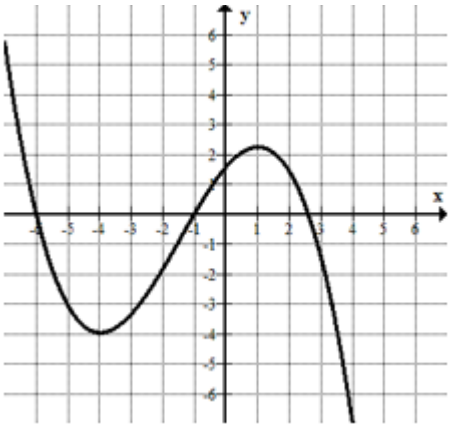
zeroes: _____

degree: _____

2.4 - Extrema and Intervals of Increasing/Decreasing

For each graph and equation, determine all zeroes and their multiplicity and determine all points of extrema. Then determine the interval(s) over which the function is increasing and/or decreasing.

1.



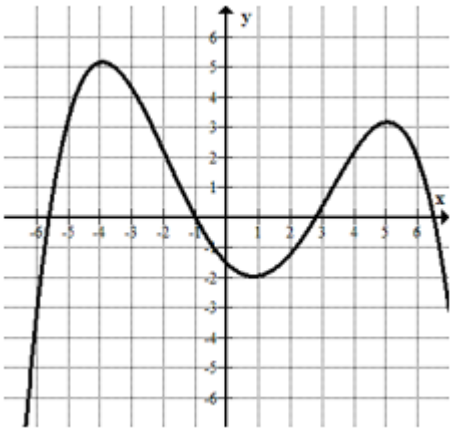
Zeroes: _____

Extrema: _____

Inc: _____

Dec: _____

2.



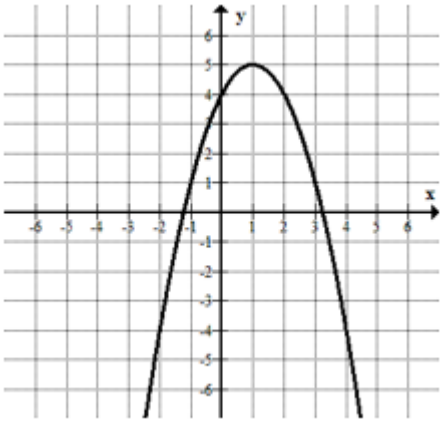
Zeroes: _____

Extrema: _____

Inc: _____

Dec: _____

3.



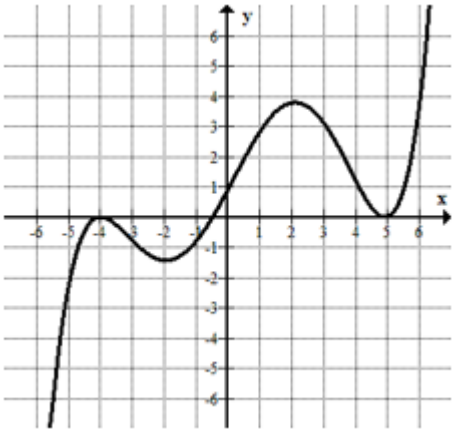
Zeroes: _____

Extrema: _____

Inc: _____

Dec: _____

4.



Zeroes: _____

Extrema: _____

Inc: _____

Dec: _____

5. $f(x) = x^3 + 3x^2 - 9x - 27$

Zeroes: _____

Extrema: _____

Inc: _____

Dec: _____

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

Zeroes: _____

Extrema: _____

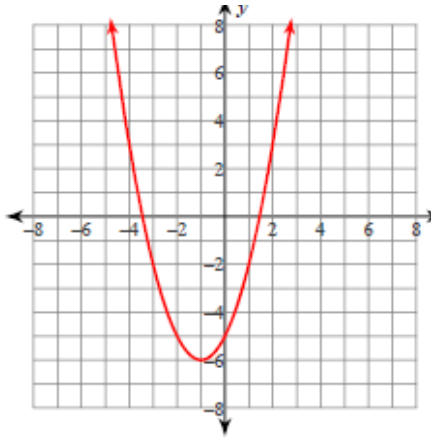
Inc: _____

Dec: _____

2.5 - End Behavior

For each graph and equation, determine the end behavior. Then determine the interval(s) over which the function is positive and/or negative.

1.

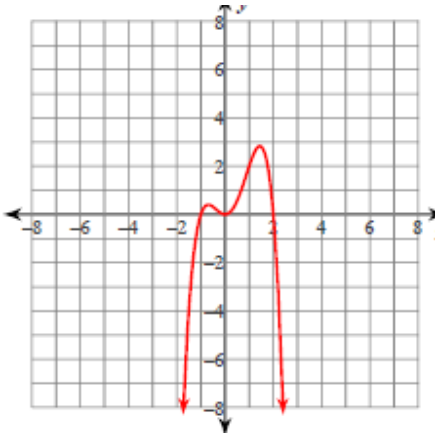


End Behavior: _____

Pos: _____

Neg: _____

2.

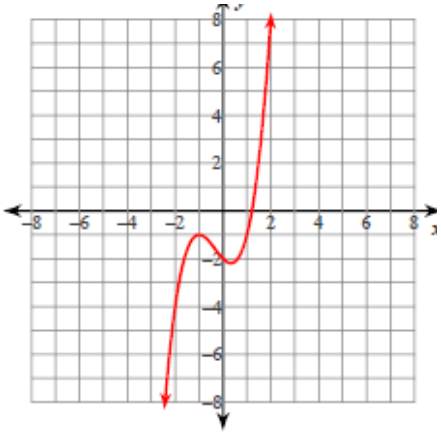


End Behavior: _____

Pos: _____

Neg: _____

3.

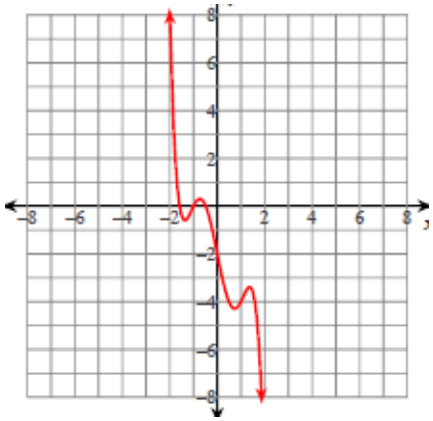


End Behavior: _____

Pos: _____

Neg: _____

4.



End Behavior: _____

Pos: _____

Neg: _____

5. $f(x) = 3x^3 + 3x^2 - 63x - 135$

End Behavior: _____

Pos: _____

Neg: _____

6. $f(x) = -4x^2 + 20x + 24$

End Behavior: _____

Pos: _____

Neg: _____

7. $f(x) = -x^5 + 5x^4 + 5x^3 - 45x^2 + 108$

End Behavior: _____

Pos: _____

Neg: _____

8. $f(x) = 2x^4 - 32x^3 + 156x^2 - 224x + 98$

End Behavior: _____

Pos: _____

Neg: _____

2.6 - Solve Polynomials Completely

Solve each polynomial completely. Start by graphing to find all real zeroes. Then (if needed), divide them out and solve what is left to find complex zeroes.

1. $x^3 + 5x^2 + 11x + 10 = 0$

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

3. $x^4 + 8x^3 + 21x^2 + 22x + 8 = 0$

4. $x^3 - 3x^2 - x - 12 = 0$

5. $2x^4 + 16x = 0$

6. $x^4 + 6x^2 - 16x + 9 = 0$

2.7 - Polynomial Applications

1. The weight of an ideal round-cut diamond can be modeled by $w = 0.0071d^3 - 0.090d^2 + 0.48d$, where w is the diamond's weight (in carats) and d is its diameter (in millimeters). According to the model, what is the weight of a diamond with a diameter of 15 millimeters?

2. The profit P (in millions of dollars) for a t-shirt manufacturer can be modeled by $P = -x^3 + 4x^2 + x$, where x is the number of t-shirts produced (in millions). Currently, the company produces 4 million t-shirts and makes a profit of $4,000,000. What lesser number of t-shirts could the company produce and still make the same profit?

3. You are designing a rectangular swimming pool that is to be set into the ground. The width of the pool is 5 feet more than the depth, and the length is 35 feet more than the depth. The pool holds 2000 cubic feet of water. What are the dimensions of the pool?

4. For a grocery store that opened in 2010, its annual revenue R (in millions of dollars) can be modeled by the function $R = 0.0001\left(t^4 + 12t^3 - 77t^2 + 600t + 13650\right)$, where t is the number of years since the store opened. In which year(s) was the revenue $1.5 million?

5. Using the picture below, find the area of the garden, the area of the garden and walkway, and the area of the walkway.

garden: _____

garden and walkway: _____

walkway: _____

6. Given that the volume of the box is $2x^3 + 17x^2 + 46x + 40$, find the missing dimension.