Polynomial Functions
Algebra 2: End Behavior Homework

Name: _____

Complete the following <u>without</u> a calculator. Determine the following: a) the leading coefficient, b) the degree of the polynomial, and c) the end behavior of the graph. Answers to part (c) will be in the following form:

(↖, ↗) (↙, ↘) (↙, ↗) (↖, ↘)

1. $y = x^2 - 5x + 2$
   a. +
   b. even
   c. ↑, ↑

2. $y = -5x^4 - 4x^2$
   a. −
   b. even
   c. ↓, ↓

3. $m(x) = 7x^6 - 2x^2 + 7x$
   a. +
   b. even
   c. ↑, ↑

4. $f(x) = \frac{1}{2}x^4 - 2$
   a. +
   b. even
   c. ↑, ↑

5. $y = -\frac{1}{2}x^3 + 4x^2 + x - 1$
   a. −
   b. odd
   c. ↑, ↓

6. $h(x) = x - x^3 + 5$
   a. −
   b. odd
   c. ↑, ↓

7. $y = -\frac{1}{5}x^5 + 2x^4 - x + 8$
   a. −
   b. odd
   c. ↑, ↓

8. $k(x) = 3x^2 + 5 + 7x^3$
   a. +
   b. odd
   c. ↓, ↑

9. $8x - 6x^7 + 4x^6 - 2x^3$
   a. −
   b. odd
   c. ↑, ↓

10. $f(x) = 9x^{11} + 4x^8 - 3x + 2$
    a. +
    b. odd
    c. ↓, ↑

11. $y = (x-2)(x+4)(x-3)$
    a. +
    b. odd
    c. ↓, ↑

12. $f(x) = (x-1)^8$
    a. +
    b. even
    c. ↓, ↑

13. $y = -4(x^2 + -4x^5)$
    a. +
    b. odd
    c. ↓, ↑

14. $y = -3 + 4x^2 + 5x^6$
    a. +
    b. even
    c. ↑, ↑

15. $y = 234x^{34} - 3$
    a. +
    b. even
    c. ↑, ↑

16. $y = x^3 + -x^5 + x^7 + -x^9$
    a. −
    b. odd
    c. ↑, ↓

17. $f(x) = 5x^3 + 7x^9 - 4x^4$
    a. +
    b. odd
    c. ↓, ↑

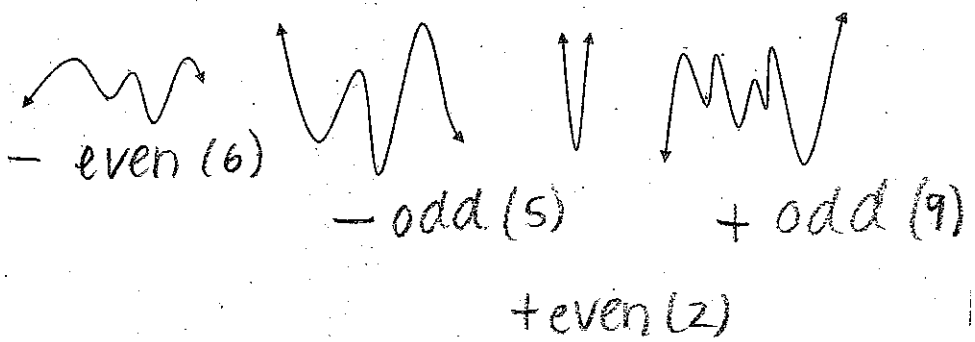
18. $y = -0.3x^{12} + 5x - 14$
    a. −
    b. even
    c. ↓, ↓

19. $f(x) = -5x + 2$
    a. −
    b. odd
    c. ↑, ↓

20. $f(x) = 276x^{56}$
    a. +
    b. even
    c. ↑, ↑

21. $f(x) = 23x^2 + 3x - 48$
    a. +
    b. even
    c. ↑, ↑

22. Write down what the leading term and the degree would look like for the polynomials with these graphs...

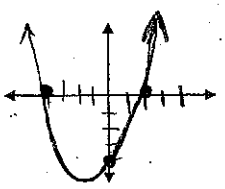
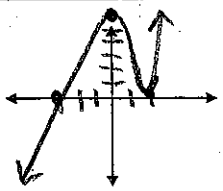
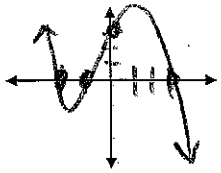
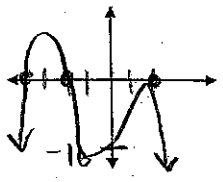


HOMEWORK

Polynomial Functions Name: _____

Polynomial Functions and Their Graphs (Patterns of Polynomials) Worksheet

Fill out this table. Sketch the graph of this function using the critical points.

Function	$f(x) = \frac{1}{2}(x-2)(x+4)$	$f(x) = \frac{1}{2}(x-2)^2(x+3)$	$f(x) = -\frac{1}{2}(x+2)(x+1)(x-3)$	$f(x) = -\frac{1}{2}(x-2)^2(x+2)(x+4)$
Leading Coefficient	1/2 +	1/2 +	−1/2 −	−1/2 −
Degree	2 even	3 odd	3 odd	4 even
Number of Linear Factors	2	3	3	4
End Behavior	(↑, ↑)	(↓, ↑)	(↑, ↓)	(↓, ↓)
Number of Turning Points	1	2	2	3
y-intercept	$\frac{1}{2}(-2)(4) = -4$	$\frac{1}{2}(-2)^2(3) = 6$	$-\frac{1}{2}(2)(1)(-3) = 3$	$-\frac{1}{2}(-2)^2(2)(4) = -16$
Number of Real Zeros	Crossing: 2 (2,0)(−4,0) Touching: 0 Total: 2	Crossing: 1 (−3,0) Touching: 2 (2,0) Total: 3	Crossing: 3 (−2,0)(−1,0)(3,0) Touching: 0 Total: 3	Crossing: 2 (−2,0)(−4,0) Touching: 2 (2,0) Total: 4
Sketch of Graph				

HOMEWORK

Polynomial Functions Name: _____

Polynomial Functions & their Graphs WITHOUT a Graphing Calculator

Summary

- The *maximum possible* number of turning points is one less than the degree of the polynomial.
- The *maximum possible* number of zeros of a polynomial is the same as its degree.
- The graph of a polynomial will touch, but not cross, the x-axis at zeros of even multiplicity.
- The graph of the polynomial will cross the x-axis at zeros of odd multiplicity.

Directions: Complete each of the following WITHOUT a graphing calculator. Sketch a *general* graph of the function. Be sure to include the x-intercepts and y-intercept on this graph!

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

a. Leading Coefficient: a = −2 −

b. Degree: 3 odd

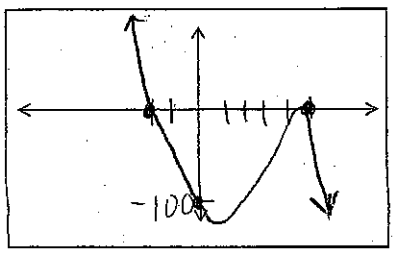
c. End Behavior (↑, ↓)

d. Cross: 1 (−2,0) Touch: 2 (5,0) Total: 3

e. y-intercept: $-2(2)(-5)^2 = -100$

f. Max number of Turning Points: 2

g. Sketch the graph of the function.



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

a. Leading Coefficient: a = 3 +

b. Degree: 4 even

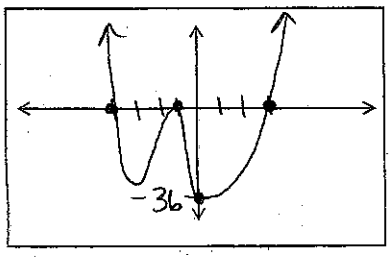
c. End Behavior (↑, ↑)

d. Cross: 2 (4,0)(3,0) Touch: 2 (−1,0) Total: 4

e. y-intercept: $3(4)(-3)(1)^2 = -36$

f. Max number of Turning Points: 3

g. Sketch the graph of the function.



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

a. Leading Coefficient: a = −1 −

b. Degree: 5 odd

c. End Behavior (↑, ↓)

d. Cross: 1 (1,0) Touch: 4 (3,0)(−1,0) Total: 5

e. y-intercept: $-1(-3)^2(1)^2(-1) = 9$

f. Max number of Turning Points: 4

g. Sketch the graph of the function.