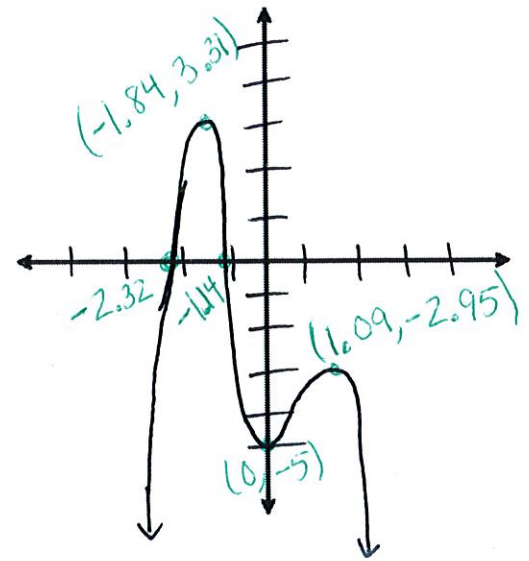


Name: _____

Date: _____

1. Graph $f(x) = -x^4 - x^3 + 4x^2 - 5$ and find the characteristics. Label zeros and extrema to 2 decimals.

Increasing: $(-\infty, -1.84) \cup (0, 1.09)$	Decreasing: $(-1.84, 0) \cup (1.09, \infty)$
x-intercepts: $(-2.32, 0) (-1.14, 0)$	y-intercept: $(0, -5)$
Rel. Max: $(-1.84, 3.31) (1.09, -2.95)$	Rel. Min: $(0, -5)$
Abs. Max: $(-1.84, 3.31)$	Abs. Min: n/a
Symmetry: no symmetry	Range: $(-\infty, 3.31]$



2. Determine the end behavior, maximum number of extrema, and possible rational solutions

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

$x \rightarrow -\infty, f(x) \rightarrow -\infty$
 $x \rightarrow \infty, f(x) \rightarrow -\infty$

extrema 3

Possible Rational Solutions: $\pm 1, \pm 2, \pm \frac{2}{3}, \pm \frac{1}{3}$

$g(x) = 2x^4 - 4x^2 + 6x^5 - x + 6$

$x \rightarrow -\infty, f(x) \rightarrow -\infty$
 $x \rightarrow \infty, f(x) \rightarrow \infty$

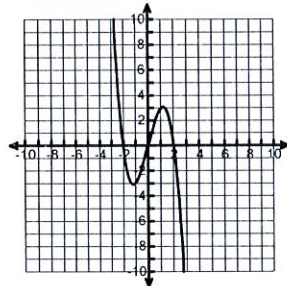
extrema 4

Possible Rational Solutions: $\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$

3. State the sign of the leading coefficient, whether the degree is even or odd, and least possible degree.

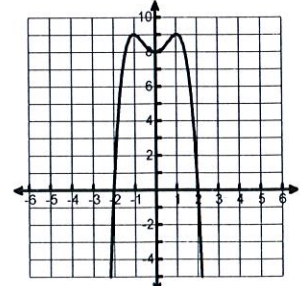
a)

- * negative
- * odd
- * 3



b)

- * negative
- * even
- * 4



4. Describe the Symmetry

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

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

$h(x) = x^5 - 3x^3$

no symmetry

symmetric about y-axis

sym. about origin

5. True or False

The range of a quartic function is always $(-\infty, \infty)$

False

Odd Degree Polynomials have an Absolute Max or Absolute Min

False

A Quadratic function with a negative leading coefficient will have an Absolute Max

True

A Cubic Function will have 3 extrema

False

6. Verify that $(x + 3)$ is a factor of

$$f(x) = x^4 + 9x^2 + 18$$

$$\begin{array}{r} -3 \overline{) 1 \ 0 \ 9 \ 0 \ 18} \\ \underline{\downarrow -3 \ 9 \ -54 \ 162} \\ 1 \ -3 \ 18 \ -54 \ 180 \end{array}$$

No, not a factor!

7. Determine all of the **x-intercepts** of

$$f(x) = x(x - 3)(2x - 5)$$

$$(0, 0)(3, 0)(5/2, 0)$$

8. Given the zeros, $-3, 1 + 2i$

a. What are the **factors** of the polynomial?

$$(x + 3)(x - 1 + 2i)(x - 1 - 2i)$$

b. Write the **equation** of the polynomial.

$$(x + 3)[((x - 1) + 2i)((x - 1) - 2i)]$$

$$(x + 3)[(x - 1)^2 - 4i^2]$$

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

$$x^3 + x^2 - x + 15$$

9. Given the zeros, $0, -4, \sqrt{3}$

a. What are the **factors** of the polynomial?

$$x(x + 4)(x - \sqrt{3})(x + \sqrt{3})$$

b. Write the **equation** of the polynomial.

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

$$x^4 + 4x^3 - 3x^2 - 12x$$

If $f(x)$ = some polynomial, and $f(3) = 0$ and $f(0) = -1$

10. What is the y-intercept?

$$(0, -1)$$

11. What is a factor we know?

$$(x - 3)$$

Find all of the indicated zeros, roots, solutions, or factors:

12. $f(x) = 8x^3 - 125$

$$a = 2x$$

$$b = 5$$

$$(2x - 5)(4x^2 + 10x + 25)$$

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

GCF: x^2

Zeros: $5/2, -5/4 \pm \frac{5i\sqrt{3}}{4}$

Factors: $x^2(2x - 1)(x + 2)$

14. $f(x) = x^3 - 7x^2 + 16x - 12$

Table
2, 3

Factors: $(x-2)(x-2)(x-3)$

15. $f(x) = 3x^3 - 11x^2 - 9x + 50$

Table
-2

Roots: $-2, \frac{17}{6} \pm \frac{i\sqrt{11}}{6}$

16. $f(x) = x^4 - x^3 + x^2 - 7x - 42$

Table
-2, 3

Solutions: $-2, 3, \pm i\sqrt{7}$

17. $f(x) = 2x^4 + 3x^3 - 30x^2 - 15x + 100$

Table
-4

x-intercepts: $(-4, 0), (5/2, 0), (\sqrt{5}, 0), (-\sqrt{5}, 0)$

18. $f(x) = x^3 + 9x^2 + 3x - 13$

Table
1

Roots: $1, -5 \pm 2\sqrt{3}$

19. $f(x) = x^4 - 6x^3 - 3x^2 - 24x - 28$

Table
7, -1

Factors: $(x-7)(x+1)(x-2i)(x+2i)$