

# Chapter 2 Study Guide

Name: \_\_\_\_\_ Date: \_\_\_\_\_

\*\*\*\*\* THIS IS NOT HOMEWORK\*\*\*\*\*

2.1	2.2	2.3	2.4	2.5
Quadratics Standard Form Vertex X-Intercepts Writing Equations	Parts of Polynomial End Behavior Leading Coefficient Zeros/Multiplicity Sketching Graphs	Long Division Synthetic Division Rational Zeros Test Descartes' Rule of Signs Calculator—Zeros	Complex Numbers • Equality • Adding • Subtracting • Multiplying • Dividing	Fundamental Theorem of Algebra Finding the polynomial given the zeros Finding zeros given any polynomial

**Lesson 2.1**— Describe the graph of the function and identify the vertex. Identify any x-intercepts.

1.  $f(x) = (x - 4)^2 - 4$   $V: (4, -4)$

X-Int:  $(0, 0)$   $(2, 0)$

2.  $f(x) = 3x^2 - 12x + 11$   
 $3(x^2 - 4x + 4) - 3(4) + 11$   
 $3(x-2)^2 - 1$

$V: (2, -1)$   
 X-int:  $(1.42, 0)$   
 $(2.58, 0)$

**Lesson 2.1**— Write the standard form of the function that has the indicated vertex and passes through the point.

3. Vertex:  $(2, 3)$  Point:  $(0, 2)$   
 $2 = a(0-2)^2 + 3$   
 $-1 = 4a$   
 $a = -1/4$   
 $f(x) = -\frac{1}{4}(x-2)^2 + 3$

4. Vertex:  $(1, -4)$  Point:  $(2, -3)$   
 $-3 = a(2-1)^2 - 4$   
 $1 = a$   
 $f(x) = 1(x-1)^2 - 4$

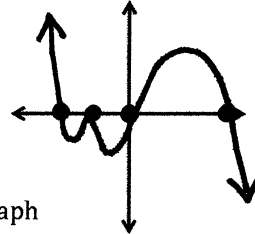
**Lesson 2.2**— State the constant, degree, leading coefficient, and number of terms. Describe the end behavior.

5.  $f(x) = -4x^3 - 8x + 21$   
 C: 21  
 D: 3  
 LC: -4  
 #: 3  
 odd negative

6.  $f(x) = x(x-5)^4(x+3)^3(x-1)^2$   
 C: NA  
 D: 10  
 LC: 1  
 #: NA  
 even positive

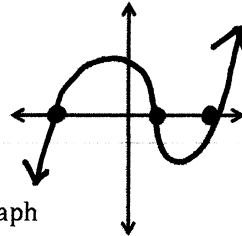
**Lesson 2.2**— Use the function,  $f(x) = -x(x+2)^3(x-3)^3(x+1)^2$  to answer the following.

- State the degree and leading coefficient  
 $9 \rightarrow$  odd  $-1 \rightarrow$  negative
- Determine the real zeros.  
 $x=0$   $x=-2$   $x=3$   $x=-1$
- State the multiplicity of each zero.  
 Cross Cross Cross bounce
- Graph the x-intercept points and sketch the polynomial graph



**Lesson 2.2**— Use the function,  $f(x) = x^3 - x^2 - 4x + 4$  to answer the following.

- State the degree and leading coefficient  
 $3 \rightarrow$  odd  $1 \rightarrow$  positive
- Determine the real zeros.  
 $x=-2$   $x=1$   $x=2$
- State the multiplicity of each zero.  
 Cross Cross Cross
- Graph the x-intercept points and sketch the polynomial graph



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

**Lesson 2.3**— Dividing using Long Division or Synthetic Division.

15.  $(2x^5 - 15x^3 - 9x^2 + 11x + 12) \div (x + 2)$

$2x^4 - 4x^3 - 7x^2 + 5x + 1 + \frac{10}{x+2}$

16.  $(x^4 - x^3 - 19x^2 - 3x - 19) \div (x - 5)$

$x^3 + 4x^2 + x + 2 - \frac{9}{x-5}$

17.  $(10x^4 - 4x^3 + 14x^2 - 14x - 16) \div (2x - 2)$

$5x^3 + 3x^2 + 10x + 3 - \frac{10}{2x-2}$

18.  $(9x^5 - 9x^4 - x^3 - 12x^2 + x - 11) \div (3x - 5)$

$3x^4 + 2x^3 + 3x^2 + x + 2 - \frac{1}{3x-5}$

19.  $(16x^4 + 4x^3 + 2x^2 - 12x + 7) \div (4x - 1)$

$4x^3 + 2x^2 + x - 3 + \frac{4}{4x-1}$

20.  $(6x^5 + 21x^4 - 14x^3 - 8x^2 + x - 6) \div (x + 4)$

$6x^4 - 3x^3 - 2x^2 + 1 - \frac{10}{x+4}$

**Lesson 2.3**— Use the Rational Zero Test to list all possible rational zeros of  $f$ .

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

22.  $f(x) = 10x^3 + 21x^2 - x - 6$

PRZ =  $\frac{\pm 1 \pm 2 \pm 3 \pm 6}{\pm 1 \pm 2 \pm 5 \pm 10}$

PRZ =  $\frac{\pm 1 \pm 3}{1 \ 2 \ 4}$

$1$  and  $-3/4$

$f(1) = 0$   
 ~~$f(2) =$~~   
 ~~$f(3) =$~~   
 ~~$f(4) =$~~   
 $f(1/2) =$   
 ~~$f(3/2) =$~~   
 ~~$f(5/2) =$~~   
 ~~$f(7/2) =$~~   
 $f(1/4) =$   
 ~~$f(3/4) =$~~   
 ~~$f(5/4) =$~~   
 ~~$f(7/4) =$~~   
 $f(-1/2) = 0$

$-2, -3/5, 1/2$

**Lesson 2.3**— Use Descartes' Rule of Signs to determine the possible numbers of + & - real zeros of the function.

23.  $g(x) = 5x^3 - 6x + 9$

2 positive

$g(-x) = -5x^3 + 6x + 9$

1 negative

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

3 positive

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

0 negative

**Lesson 2.4**— Find .

25.  $(2 - 4i)(-6 + 4i) = 4 - 16i$

28.  $(3 + 3i) + (8 - 2i) - 7 = 4 + i$

30.  $\frac{-3+10i}{-2-6i} = \frac{-54}{40} - \frac{38i}{40}$

26.  $(1 - 7i)^2 = -48 - 14i$

29.  $\frac{4-9i}{-6i} = \frac{54}{36} + \frac{24i}{36}$

31.  $\frac{2i}{2+3i} = \frac{6}{13} + \frac{4i}{13}$

27.  $(-3 + 6i) - (-5 - 3i) - 8i = 2 + i$

**Lesson 2.5**— A polynomial function with rational coefficients has the follow zeros, find the polynomial.

32.  $-1, 1 + 3i$

$f(x) = (x+1)(x-1-3i)(x-1+3i)$   
 $f(x) = x^3 - x^2 + 7x + 9$

33.  $-3, -3, 2\sqrt{2}$

$f(x) = (x+3)(x+3)(x-2\sqrt{2})$   
 $f(x) = x^3 + (2\sqrt{2}+6)x^2 + (9-12\sqrt{2})x - 18\sqrt{2}$   
 $f(x) = x^3 + 3.17x^2 - 7.97x - 25.46$

34.  $1 - i, \sqrt{7}$

$f(x) = (x-\sqrt{7})(x-1+i)(x-1-i)$   
 $f(x) = x^3 - 4.6x^2 + 7.3x - 4.6$

**Lesson 2.5**— Find all the zeros of the function and write the polynomial as a product of linear factors. .

33.  $f(x) = x^4 - 36$

$f(x) = (x+2)(x-2)(x+2i)(x-2i)$   
 $x = -2, 2, -2i, 2i$

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

$f(x) = (x-1)(x-(1+i))(x-(1-i))$   
 $x = 1, 1+i, 1-i$

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

$f(x) = (x+1)(x-2)(x-2)(x+i)(x-i)$   
 $x = -1, 2, 2, i, -i$

37.  $f(x) = x^4 + 6x^3 + 18x^2 + 54x + 81$

$f(x) = (x+3)(x+3)(x+3i)(x-3i)$   
 $x = -3, -3, 3i, -3i$

35.  $f(x) = x^3 + 4x^2 - 7x - 10$

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

38.  $f(x) = 4x^2 + 25 = \sqrt{4x^2} - \sqrt{-25}$

$f(x) = (2x-5i)(2x+5i)$   
 $x = \frac{5i}{2}, -\frac{5i}{2}$