Advanced Algebra
Chapter 7 Outline

7-1
16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 47, 48, 57, 58 (20)

7-2
14, 16, 18, 20, 22, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 41, 42, 48, 50 (20)

7-3
Day 1: Study Guide 1-16 (16)
Day 2: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34 (22)

7-4
14, 16, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 37, 38, 39, 40, 47, 49, 52 (20)

Review/Quiz on 7-1, 7-2, and 7-3

7-5
14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 43, 44, 45, 52, 53 (20)

7-6
12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 35, 36, 37, 38, 46, 50, 52, 56 (20)

7-7
Day 1: 2, 3, 4, 5, 6, 7, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28 (18)
Day 2: 30, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51 (20)

Worksheets

Quiz on 7-4, 7-5, 7-6, and 7-7

7-8
14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 39, 40, 41, 46, 47, 48, 51 (20)

7-9
14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 33, 34, 35, 38, 39, 40, 42, 44 (18)

Review
Pages 400-404, 2-58 even

Review
Page 400-404, 1-57 odd

Chapter 7 Test

7-1 Polynomial Functions

Objective: Evaluate polynomial functions.
ID general shapes and graphs of polynomial functions.

P.346

Polynomial	Expression	Degree	Leading Coefficient
Constant	9	0	9
Linear	$x - 2$	1	1
Quadratic	$3x^2 + 4x - 5$	2	3
Cubic	$4x^3 - 6$	3	4
General	$a_0x^n + a_1x^{n-1} + \ldots + a_{n-2}x^2 + a_{n-1}x + a_n$	n	a_0

* Polynomial in one variable

Greatest exponent of its variable

Coefficient of term w/ highest degree

I. Find degree, leading coefficient, & if polynomial in one variable.

Ex1) $7z^3 - 4z^2 + z$

Ex2) $6a^3 - 4a^2 + ab^2$

Ex3) $3c^2 + 4c - \frac{2}{c}$

Ex4) $9y - 3y^2 + y^4$

II. Evaluate a Polynomial

Ex5) $f(r) = 2r^2 - 3r + 1$, Find f(4) and f(6)

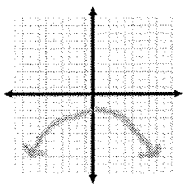
Ex6) $p(x) = 2x^4 - x^3 + 3x$. Find $p(y^3)$

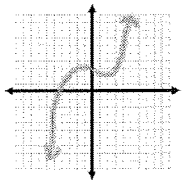
Ex7) $b(m) = 2m^2 + m + 1$ Find $b(2x-1) - 3b(x)$

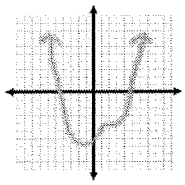
III. Graphs of Polynomial Functions

** Pg. 348 Chart - Discuss looks of Graph
** Pg. 349 Chart - Discuss end behavior

Ex8) For each Describe: 1. End Behavior 2. Odd/even degree #. # of real zeros

A) 

B) 

C) 

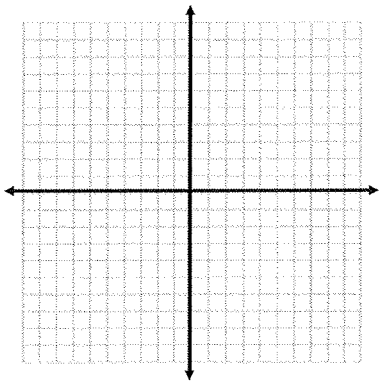
7. 2 Graphing Polynomial Functions

Objective: Graph polynomial functions and locate their zeros
Find maxima & minima of polynomial functions

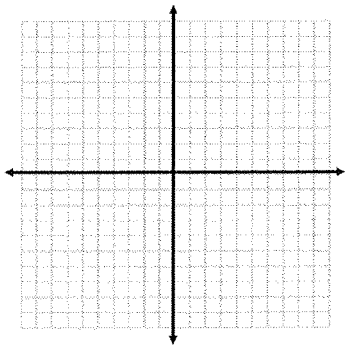
Ignore book directions since we are using graphing calculators

A) Graph by making a table of values (≈ 6)
B) Find the zeros
C) Find maxima & Minima
** Find all info before Graphing

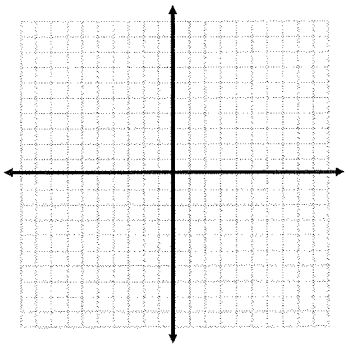
Ex1) $F(x) = -x^3 - 4x^2 + 5$



#14
Ex2) $f(x) = x^3 - 2x^2 + 6$



#16 Optional



7.3 Solving Equations Using Quadratic Techniques

Objective: Write expressions in Quadratic Form

Quadratic Form: $au^2 + bu + c$

for any a,b,c where $a \neq 0$ and u is some expression in x .

I. Write each Expression in Quadratic Form, if possible.

Ex1) $x^4 + 13x^2 + 36$

Ex2) $2x^6 + x^3 + 9$

Ex3) $10b^4 + 3b^2 - 11$

Ex4) $16x^6 - 625$

Ex5) $7x^{10} + 6$

Ex6) $12x^8 - x^2 + 10$

Ex7) $x^4 + 2x^3 - 1$

Ex8) $x - 9x^{1/2} + 8$

Ex9) $x^{2/3} + 2x^{1/3} - 4$

7.3 Solving Equations Using Quadratic Techniques

Objective: Use Quadratic techniques to solve equations

I. Solve using Quadratic Techniques

Ex1) $x^4 - 13x^2 + 36 = 0$

Ex2) $x^4 - 29x^2 + 100 = 0$

Ex3) $x^{2/3} - 6x^{1/3} + 5 = 0$

Ex4). $x^{1/2} - x^{1/4} - 6 = 0$

Ex5) $x - 6\sqrt{x} = 7$

Ex6) $x + \sqrt{x} = 12$

Ex7) $x^3 + 343 = 0$

7.4 The Remainder & Factor Theorems

Objective: Evaluate functions using synthetic substitution
Determine whether a binomial is a factor of a polynomial by using synthetic substitution

$f(a) = 4a^2 - 3a + 6$ divide this by $(a - 2)$

$$
\begin{array}{r|l}
a - 2 & 4a + 5 \\
\hline
 & 4a^2 - 3a + 6 \\
 & (-)\ 4a - 2a \\
\hline
 & 0 \quad 5a + 6 \\
 & (-)\ 5a - 10 \\
\hline
 & +16
\end{array}
$$

$$
\begin{array}{r|lll}
2) & 4 & -3 & 6 \\
 & & 8 & 10 \\
\hline
 & 4 & 5 & 16
\end{array}
$$

$f(2) = 4(2)^2 - 3(2) + 6 = 16 - 6 + 6 = 16$

** This Illustrates the Remainder Theorem:

If f(x) is divided by x-a, then the remainder is the constant f(a).

Dividend equals quotient times divisor plus remainder

f(x) = q(x) x (x-a) + f(a)

Ex1) Find f(4) if $f(x)=3x^4 - 2x^3 + x^2 - 2$.

Ex2) Show that x-3 is a factor of $x^3 + 4x^2 - 15x - 18$.

Factor Theorem: The binomial x-a is a factor of the polynomial f(x) if and only if f(a) = 0

Ex3) Show that x+3 is a factor of $f(x) = x^3 + 6x^2 - x - 30$.

Ex4) Find all factors of $v(x) = x^3 + 3x^2 - 36x + 32$ if x - 4 is a factor.

Ex5) $V(x)=x^3 + 7x^2 + 2x - 40$. Find the missing measures.

7.5 Roots and Zeros

Objective: Determine the # and types of roots for a polynomial equation.
Find the zeros of a polynomial function.

Fundamental Theorem of Algebra pg. 371

- Every polynomial equation of degree greater than zero has at least 1 root in the set of complex numbers.

I. Determine the # and Type of Roots

Ex1) $a - 10 = 0$

Ex2) $x^2 + 2x - 48 = 0$

Ex3) $3a^3 + 18a = 0$

Ex4) $y^4 - 16 = 0$

-So p(x) of degree n will have n roots including the imaginary ones.

II. Decartes Rule of Signs: finds # of positive or negative zeros pg.372

Ex5)

Positive: Use P(x)

$$p(x) = \underbrace{x^5}_{y} \underbrace{- 6x^4}_{n} \underbrace{- 3x^3}_{y} \underbrace{+ 7x^2}_{y} \underbrace{- 8x}_{y} + 1$$

4 sign changes(y's), so there are 4,2, or 0 posiive real zeros.

Negative: use P(-x)

$$P(-x) = (-x)^5 - 6(-x)^4 - 3(-x)^3 + 7(-x)^2 - 8(-x) + 1$$

$$P(-x) = \underbrace{-x^5}_{n} \underbrace{- 6x^4}_{y} \underbrace{+ 3x^3}_{n} \underbrace{+ 7x^2}_{n} \underbrace{+ 8x}_{n} + 1$$

One sign change(y), so there is 1 negative real zero

Possible Combinations of Zeros

Positive Real	Negative Real	Imaginary	Total
4	1	0	5
2	1	2	5
0	1	4	5

III. Find all zeros of the polynomial (Hint: Use calc to find rational zeros first)

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

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

IV. Write a polynomial given zeros

Ex8) x = 4, 4-i

Ex9) x = 3, 2-i

7.6 Rational Zero Theorem

Objective: ID the possible rational zeros of a polynomial function
Find all rational zeros of a polynomial function

Rational Zero Theorem: gives a finite list of all possible rational zeros to help narrow down choices.

I. ID all Possible Zeros Using

Ex1) $f(x) = 2x^3 - 11x^2 + 12x + 9$
(2: Q, 9: P)

Q: The leading coefficient
P: The constant

$$\frac{P}{Q} = \frac{\text{all factors of P}}{\text{all factors of Q}} : \frac{\pm 1, \pm 3, \pm 9}{\pm 1, \pm 2}$$

Possible Rational Zeros
$\pm 1, \pm 1/2, \pm 3, \pm 3/2, \pm 9, \pm 9/2$

12 potential zeros

Ex2) $F(x) = 3x^4 - x^3 + 4$

II. Find all Zeros.

Ex3) $f(x) = 2x^4 - 13x^3 + 23x^2 - 52x + 60$

Ex4) $f(x) = x^4 + x^3 - 19x^2 + 11x + 30$

Ex5) $v=1120\ ft^3$ Find dimensions.

7.7 Operations of Functions

Objective: Find the sum, difference, product, and quotient of functions
Find the composition of functions

I. Operations with Functions

Let $f(x) = x+2$, $g(x) = 3x$, then

Sum: $(f + g)(x) = f(x) + g(x)$

Difference: $(f - g)(x) = f(x) - g(x)$

Product: $(f \cdot g)(x) = f(x) \cdot g(x)$

Quotient: $(f/g)(x) = f(x)/g(x)$

Ex1) $f(x) = 3x^2 + 7x$ $g(x) = 2x^2 - x - 1$, Find each function

II. Composition of Functions: $(f \circ g)(x) = f(g(x))$

· To evaluate $f \circ g$, evaluate g(x) first, then use the range of g as the domain of a and evaluate f(x).

Ex2) $f = \{(3, 4), (2,3), (-5,0)\}$
$g = \{(3,-5), (4,3), (0,2)\}$

Ex3) $f(x) = \{(2,6), (9,4), (7,7), (0,-1)\}$
$g(x) = \{(7,0), (-1,7), (4,9), (8,2)\}$

-So $f \circ g$ does not equal $g \circ f$ in most instances, therefore, the order in which you compose is important.

7.7 Operations with Functions Day 2

I. Simplifying Composition of Functions

Ex1) $f(x) = x + 3$ $g(x) = x^2 + x - 1$ Find $(f \circ g)x$ and $(g \circ f)x$.

Evaluate if $x = 2$.

Ex2) $f(x) = 3x^2 - x + 4$ $g(x) = 2x - 1$ $h(x) = x^2 - 3$

Evaluate $x = -2$

A. $f(g(-1))=$

B. $h(g(4))=$

C. $(f \circ (h \circ g))(2)=$

Ex3) Tracy has $100 deducted from every paycheck for retirement before taxes are applied, which reduces her taxable income. Her state income tax rate is 4%. If Tracy earns $1500 every pay period, find the difference in her net income if she has the retirement deduction before or after state taxes.

7.8 Inverse Functions & Relations

Objective: Find the inverse of a function or relation
Determine whether 2 functions or relations are inverses

I. Relations - set of ordered pairs
Inverse Relation - set of ordered pairs obtained by reversing the coordinates of each original ordered pairs

Ex) Relation: $f = \{(1,2), (3,4), (5,6)\}$

$f^{-1} = \{(2,1), (4,3), (6,5)\}$

II. Finding Inverses 1)switch x + y 2) Solve for y

Ex1) $f(x) = \frac{x+6}{2}$

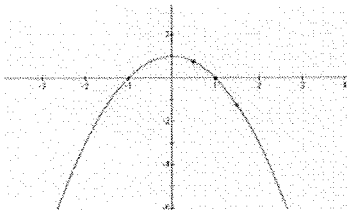
Ex2) $f(x) = \frac{-1}{2}x + 1$

III. Inverse functions - f(g(x)) = x and g(f(x))=x then the 2 functions are inverses

EX 3. f(x) = 5x + 10 g(x)=(1/5)x - 2

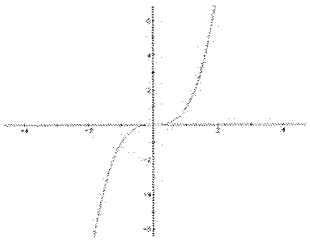
EX 4. f(x) = 6x + 2 g(x) = x - (1/3)

IV. One-to-One Test/Horizontal Line Test: If a function passes the horizontal line test then we say the function is one-to-one which means the function's inverse is a function.



Function :

Inverse function:



Function :

Inverse function:

7.9 Square Root Functions

Objective: Graph and analyze square root functions
Graph Square root inequalities.

I. Square Root Equations

Ex1) $y=\sqrt{3x+4}$ State domain, range, x and y intercepts.

Ex2) $y=\sqrt{\frac{3}{2}x-1}$ State domain, range, x and y intercepts.

II. Square Root Inequalities

Ex3) $y>\sqrt{3x+5}$

Ex4) $y\leq\sqrt{4+\frac{3}{2}x}$