

Also reference Professor Carroll's Math 31 Review notes at the Math Department web site.

**Chapter 1: The Real Number System and Chapter 2: Linear Equations and Inequalities in One Variable**

Performed the indicated operations in problems 1 - 3.

1.  $-7 - (14 - 19)$   
A) -2                      B) -1                      C) 4                      D) 2                      E) None of these
2.  $(-4)(-3) + (-2)(5)$   
A) 7                      B) -1                      C) 2                      D) -4                      E) None of these
3.  $(9 - 11)^3(8 - 10)^2$   
A) 15                      B) -28                      C) 34                      D) -32                      E) None of these
4. Simplify:  $3 - 4[x + 5(x + 6)]$   
A)  $-34x - 108$                       B)  $-24x - 117$                       C)  $56x - 100$                       D)  $-14x + 96$   
E) None of these
5. List all the irrational numbers in this set:  $\{-5, -\frac{1}{2}, \sqrt{3}, \frac{\pi}{3}, 100\}$   
A) -5, 100                      B)  $-\frac{1}{2}, \frac{\pi}{3}$                       C)  $\sqrt{3}, \frac{\pi}{3}$                       D)  $-5, -\frac{1}{2}, 100$   
E) None of these
6. Plot (-3, -1) in a rectangular coordinate system. In which quadrant does the point lie?  
A) IV                      B) III                      C) I                      D) II                      E) None of these
7. Insert either  $<$  or  $>$  between the following numbers to make the statement true:  
 $-2000 \square -1$   
A)  $<$                       B)  $>$
8. Use the distributive property to rewrite without the parentheses:  $7(3x - 2 - 4y)$   
A)  $24x - 2$                       B)  $21x - 2 - 4y$                       C)  $21x - 14 - 28y$                       D)  $7x - 2 - 4y$   
E) None of these
9. A student has grades on three examinations of 70, 86, and 78. What must the student earn on a fourth examination in order to have an average of at least 80?  
A) 80                      B) 78                      C) 90                      D) 86                      E) None of these
10. Solve:  $6 - 5(x + 3) = x - 15$   
A) 4                      B) 1                      C) -3                      D) 3                      E) None of these

Solve each inequality, and express the solution set in set-builder notation, and graph the set on a number line in problems 11, 12, and 13.

11.  $\frac{x}{2} < -4$
12.  $5x - 3 > 2(x + 4)$
13.  $7 - 8x \geq 28$

14. The length of a rectangle is 10 inches. For what widths is the perimeter greater than 30 inches?
15. Solve:  $\frac{3}{4}x = -12$
16. Solve:  $\frac{x}{5} - 3 = \frac{x}{2}$
17. Solve for  $h$ :  $V = \frac{1}{3}Ah$
18. 48 is 30% of what number?
19. What number is 6% of 140?
20. Graph the solution set of  $-3 < x \leq 5$  on the number line.

### **Chapter 3: Problem Solving**

1. Solve the proportion:  $\frac{x - 5}{x - 8} = \frac{7}{14}$
- A)  $x = -2$       B)  $x = 2$       C)  $x = \frac{-2}{3}$       D)  $x = \frac{2}{3}$       E) 18
2. A compact car can go 273 miles on 7 gallons of gas when driving on the highway. At this rate, how many miles would the car be able to go on 12 gallons of gas?
- A) 39 miles      B) 195 miles      C) 280 miles      D) 468 miles      E) 3,276 miles
3. In a triangle, the second angle is  $20^\circ$  more than the first angle, and the third angle is  $10^\circ$  more than three times the first angle. Find the measure of the first angle.
- A)  $10^\circ$       B)  $20^\circ$       C)  $30^\circ$       D)  $40^\circ$       E)  $50^\circ$
4. Verence invested \$1,000, part at 4% and the rest at 5% annual interest. How much should be invested at the 4% rate if the total interest earned at the end of 1 year is to be \$46.

<i>investment</i>	<i>principal</i>	<i>rate</i>	<i>interest earned</i>

- A) \$200      B) \$300      C) \$400      D) \$500      E) \$600
5. In a class, there are 20 men and 15 women. Find the ratio of the number of men to the number of students in the class. Express the ratio as a fraction reduced to lowest terms.
- A)  $\frac{4}{3}$       B)  $\frac{3}{4}$       C)  $\frac{3}{7}$       D)  $\frac{4}{7}$       E)  $\frac{7}{4}$

- Two buses leave a station at the same time, traveling in opposite directions. The rate of the faster bus exceeds that of the slower bus by 10 miles per hour. After 3 hours, they are 210 miles apart. What is the rate of the slower bus?
- If seven out of eight sportswriters voted that the Lakers were going to win the NBA championship this year and there were 1,600 sportswriters who voted, how many sportswriters thought the Lakers would win the championship?
- The length of a rectangular football field is 14 meters more than twice its width. If the perimeter is 346 meters, find the field's dimensions.
- A chemist needs to mix an 18% salt solution with a 45% salt solution to obtain 12 liters of a 36% salt solution. How many liters of each of the salt solutions must be used?
- The pressure of water on an object below the surface is proportional to its distance below the surface. If a submarine experiences a pressure of 25 pounds per square inch 60 feet below the surface, how much pressure will it experience 330 feet below the surface?

#### **Chapter 4: Linear Equations and Inequalities in Two Variables**

- Calculate the slope of the line passing through (3, 10) and (-2, 10)
 

A) 0            B) undefined            C) 4            D) -4            E) 10
- Find the slope of the equation  $2x - 7y = 14$ .
 

A)  $-\frac{2}{7}$             B)  $\frac{2}{7}$             C)  $\frac{7}{2}$             D)  $-\frac{7}{2}$             E) -2
- For the line with a slope of -4 and passing through (3,-8), write the equation of the line in slope-intercept form.
 

A)  $y = -4x - 4$             B)  $y = -4x + 4$             C)  $y = -4x - 20$   
 D)  $y = -4x + 20$             E)  $y = -4x - 5$
- For the line passing through the points (2, 6) and (-6, -10), write the equation of the line in slope-intercept form.
 

A)  $y = 2x + 22$             B)  $y = -2x - 22$             C)  $y = -2x - 2$   
 D)  $y = 2x - 2$             E)  $y = 2x + 2$
- Find the  $y$ -intercept of the equation  $3x - 12y = 18$ 

A)  $-\frac{2}{3}$             B)  $\frac{1}{4}$             C)  $-\frac{1}{4}$             D)  $-\frac{3}{2}$             E)  $\frac{3}{2}$
- Graph  $y = \frac{-3}{4}x + 2$  using a table of values.

7. Graph  $2x - 6y = -12$  by finding the intercepts on the coordinate axes. Make sure to point out which point is the  $x$ -intercept and which point is the  $y$ -intercept.
8. Graph  $x = -3$ .
9. Graph  $y = \frac{2}{3}x - 4$  using the slope and the  $y$ -intercept. Clearly point out the location of the  $y$ -intercept and show how you determined a second point on the line.
10. Graph the linear inequality  $-x - 5y < -10$ .

### **Chapter 5: Systems of Linear Equations and Inequalities**

1. Solve the system of equations by graphing: 
$$\begin{cases} y = \frac{3}{2}x + 1 \\ y = -2x - 6 \end{cases}$$

A) (2, -3)      B) (-2, 2)      C) (2, 2)      D) (-2, -2)      E) None of these
2. Solve the system of equations by graphing: 
$$\begin{cases} 2x - 4y = -2 \\ x + 3y = 9 \end{cases}$$

A) (3, -2)      B) (3, 2)      C) (-3, 2)      D) (-3, -2)      E) None of these
3. Solve the following system by the substitution method: 
$$\begin{cases} 3(x - 2) - y = -24 \\ y = 4x + 23 \end{cases}$$

A) (-5, 3)      B) (5, 3)      C) (-5, -3)      D) (5, -3)      E) None of these
4. Solve the following system by the substitution method: 
$$\begin{cases} x = -3y - 14 \\ x - 5(y - 4) = 54 \end{cases}$$

A) (-4, -6)      B) (-4, 6)      C) (4, -6)      D) (4, 6)      E) None of these
5. Solve the following system by the addition method: 
$$\begin{cases} 3x + 2y = 23 \\ 7x - 5y = 15 \end{cases}$$

A) (-5, 4)      B) (5, 4)      C) (5, -4)      D) (-5, -4)      E) None of these
6. Solve the following system by the addition method: 
$$\begin{cases} 3x = 4y - 30 \\ 3y = 8 - 5x \end{cases}$$

7. The perimeter of a basketball court (rectangular shape) is 240 feet. The coach of a basketball player estimates that the player has run 560 feet which is equivalent to five times the length plus four times the width. Find the length and width of the court.
8. Andrea bought nine shirts and two blouses for \$90. Michelle bought two shirts and six blouses for \$70. Find the cost of one shirt and the cost of one blouse.
9. Solve the following system of inequalities: 
$$\begin{cases} y \geq \frac{-2}{3}x + \frac{13}{3} \\ 3x + y < -3 \end{cases}$$
10. Solve the following system of inequalities: 
$$\begin{cases} 4x - 3y < -12 \\ y \leq \frac{-3}{5}x - \frac{3}{5} \\ x \leq 0 \\ y \geq 0 \end{cases}$$

## **Chapter 6: Exponents and Polynomials**

1. Subtract the polynomials and state the degree of the result:  
 $(10x^3 - 8x^2 + 7x - 12) - (13x^3 - 5x^2 + 9x - 3)$   
 A)  $-3x^3 - 3x^2 + 2x - 15$ ; (degree=3)      B)  $-3x^3 - 13x^2 - 2x - 15$ ; (degree=3)  
 C)  $-3x^3 - 3x^2 - 2x - 9$ ; (degree=3)      D)  $-3x^3 - 13x^2 - 2x + 9$ ; (degree=3)  
 E) None of these
2. Subtract the polynomials:  $(-x^3 + \frac{1}{6}x^2 - \frac{3}{4}x - 1.05) - (x^3 + \frac{3}{8}x^2 + \frac{5}{4}x - 2.5)$   
 A)  $-2x^3 - \frac{5}{24}x^2 - 2x + 1.45$       B)  $-2x^3 - \frac{1}{7}x^2 - 2x + 1.5$   
 C)  $-2x^3 - \frac{13}{24}x^2 - 3x - 3.55$       D)  $-2x^3 + \frac{2}{7}x^2 + \frac{1}{2}x + 1.45$   
 E) None of these
3. Multiply the polynomials:  $(4x + 3)(16x^2 - 12x + 9)$   
 A)  $64x^3 + 96x^2 + 72x + 27$       B)  $64x^3 - 96x^2 - 72x + 27$   
 C)  $64x^3 - 96x^2 + 72x + 27$       D)  $64x^3 + 27$       E) None of these
4. Multiply:  $(4x^2 - 6x)^2$   
 A)  $16x^4 + 36x^2$       B)  $16x^4 - 48x^3 + 36x^2$   
 C)  $16x^4 - 36x^2$       D)  $16x^4 - 48x^3 - 36x^2$       E) None of these
5. Evaluate the polynomial  $-x^2y^3 - x^3y^2 - \frac{1}{2}x^4$  for  $x = -2$  and  $y = -1$ .  
 A) -20      B) -12      C) -4      D) 4      E) None of these
6. Divide the polynomial by the monomial:  $\frac{20x^7 - 2x^2 - 4x^4x^0}{-4x^4}$

7. Divide the polynomial by the binomial:  $(15x^3 - 11x^2 - 2x + 9) \div (5x + 3)$

8. Simplify.  $\left[ \frac{(-3x^{-4})^{-2}}{(6x^{-3})^{-2}} \right]^{-1}$

9. Simplify.  $\left[ \frac{(-10)^{-5}(-2x^2)}{(-10)^{-6}(6x^5)} \right]^{-2}$

## **Chapter 7: Factoring Polynomials**

- The greatest common factor of  $44a^4b^3c^2d - 66ab^2c^3$  is  
A)  $2ab^2c^2$     B)  $2a^4b^3cd$     C)  $11ab^2c^2d$     D)  $22ab^2c^2$     E) None of these
- When factoring a polynomial of the form  $ax^2 - bx - c$ , where  $a, b, c$  are positive integers, the signs of the binomials are  
A) both positive    B) both negative    C) different    D) cannot be determined  
E) None of these
- $4x^2 + 36 =$   
A)  $(2x + 6)^2$     B)  $4(x^2 + 9)$     C)  $4(x + 3)^2$     D)  $4(x + 3)(x - 3)$     E) None of these
- If  $9x(4x - 1)(3x + 2) = 0$ , then  $x =$   
A)  $-\frac{2}{3}, 0, \frac{1}{4}$     B)  $-\frac{2}{3}, \frac{1}{4}$     C)  $-\frac{3}{2}, 0, 4$     D)  $-\frac{3}{2}, 0, \frac{1}{4}$     E) None of these
- Factor completely:  $24x^5y^2 + 22x^4y^3 - 30x^3y^4$
- Factor completely:  $-5x^4 - 20x^3 + 225x^2$
- Factor completely:  $8xy^3 - 125x$
- Solve by factoring:  $10x^2 = 12 - 7x$
- A ball is thrown up into the air from the top of a building that is 128 feet high. The height  $h$  of the ball above the ground  $t$  seconds after it is thrown is given by  $h = -16t^2 + 112t + 128$ .  
a) Determine the height of the ball 3 seconds after it has been tossed.  
b) How long will it take the ball to hit the ground?
- The width of a rectangular picture is 7 inches less than the length. The area of the picture is 78 square inches.  
a) Determine the dimensions of the picture.  
b) Find the perimeter of the picture.

## Chapter 8: Rational Expressions

- $\frac{9(2x - 5)}{5 - 2x} =$   
A) -9      B) -1      C) 1      D) 9      E) None of these
- The missing term in  $\frac{4x}{x - y} = \frac{?}{x^2 - 2xy + y^2}$  is  
A)  $4x$       B)  $4x(x + y)$       C)  $4xy$       D)  $4x(x - y)$       E) None of these
- The least common denominator (LCD) of  $\frac{7}{6y}$ ,  $\frac{y}{y + 1}$ , and  $\frac{y - 1}{2y^2}$  is  
A)  $12y(y + 1)$       B)  $6y^3(y + 1)$       C)  $6y^2(y + 1)$       D)  $12y^2(y + 1)$   
E) None of these
- $\frac{x + 2}{(x - 1)(3x + 4)}$  is undefined at  
A)  $x = -2, -\frac{4}{3}, 1$       B)  $x = -\frac{4}{3}, 1$       C)  $x = -2, -\frac{4}{3}$       D)  $x = -2, 1$   
E) None of these
- Add:  $\frac{x^2}{x - 6} + \frac{36}{6 - x}$
- Subtract:  $\frac{-12 - 2x}{x^2 + x - 30} - \frac{6}{2x - 10}$
- Divide:  $\frac{x^2 - 81}{4x + 20} \div \frac{9 - x}{x^2 - x - 30}$
- Solve:  $\frac{6}{x^2 - 7x + 12} + \frac{2x}{x - 3} = \frac{3x}{x - 4}$
- Simplify completely the complex fraction:  $\frac{5 - \frac{1}{5x^2}}{\frac{1}{2} + \frac{1}{10x}}$
- A train can travel 340 miles in the same time an express bus can travel 260 miles. If the rate of the bus is 20 mph slower than the rate of the train, find the rate of the train and the rate of the bus.

## **Chapter 9: Roots and Radicals**

1.  $\sqrt{98} + 2\sqrt{50} - \sqrt{72} =$

- A)  $10\sqrt{2}$       B)  $11\sqrt{2}$       C) 10      D) 12      E)  $\sqrt{2}$

2.  $\frac{2\sqrt{3}}{2 + \sqrt{3}} =$

- A)  $4\sqrt{3} - 6$       B)  $4\sqrt{3} - 8$       C)  $6\sqrt{3}$       D)  $\sqrt{3} - 12$       E)  $3 - \sqrt{3}$

3.  $\frac{30}{\sqrt{200}} =$

- A)  $\sqrt{30}$       B)  $\frac{\sqrt{2}}{2}$       C)  $\frac{3\sqrt{2}}{20}$       D)  $\frac{3\sqrt{2}}{2}$       E)  $\sqrt{2}$

4. If  $\sqrt{2x+1} + 2x = 5$ , then  $x =$

- A) -1      B)  $\frac{7}{2}$       C) 4      D)  $\frac{3}{2}$       E) 2

5. Simplify:  $(\sqrt{2} - 1)^2 + (2\sqrt{3})^2$

6. Simplify:  $(2\sqrt{2} + \sqrt{5})(\sqrt{10} - 2)$

7. Rationalize and simplify:  $\frac{4}{\sqrt{2}+1} + \frac{2}{2-\sqrt{2}}$

8. Solve for  $x$ :  $\sqrt{5x+1} + 7 = x$

9. Rationalize and simplify:  $\frac{4}{\sqrt{3}+1} + \frac{6}{\sqrt{3}}$



## Chapter 10: Quadratic Equations and Functions

- If  $(x + 5)^2 = 3$ , then  $x =$   
A)  $x = -3 \pm \sqrt{5}$       B)  $x = -1 \pm \sqrt{3}$       C)  $x = 5 \pm \sqrt{3}$   
D)  $x = -5 \pm \sqrt{3}$       E)  $x = \pm \sqrt{3}$
- If  $(0.2)x^2 - \frac{2}{5}x = 16$ , then  $x =$   
A)  $x = 2$  only      B)  $x = 2$  or  $x = 8$       C)  $x = -4$  or  $x = 10$   
D)  $x = -8$  or  $x = 10$       E)  $x = 8$  only
- The length of the hypotenuse of a right triangle whose legs are 9 inches and 12 inches is:  
A) 21 in.      B) 15 in.      C)  $\sqrt{197}$  in.  
D) 17 in.      E)  $\sqrt{193}$  in.
- Solve (using the quadratic formula):  $x^2 - 4x - 2 = 0$   
A)  $x = 2 \pm \sqrt{6}$       B)  $x = -2 \pm \sqrt{6}$       C)  $x = 1 \pm \sqrt{3}$   
D)  $x = -2 \pm \sqrt{3}$       E)  $x = 4 \pm \sqrt{3}$
- Given a right triangle with hypotenuse 1 inch and one leg  $\frac{\sqrt{3}}{2}$  inch, the length of the other leg is:  
A)  $\sqrt{3}$  in.      B)  $\sqrt{6}$  in.      C)  $\frac{1}{2}$  in.  
D) 1 in.      E)  $\sqrt{2}$  in.
- Solve for  $x$ :  $x(x + 2) = x(2x + 5)$
- Complete the square:  $x^2 - 7x$
- Solve for  $x$ :  $\frac{1}{2}x^2 - \frac{2}{3}x = 1$
- Solve for  $x$ :  $2x^2 + 4x = 3$

## Answer Key

### Chapters 1 and 2

- 1) A    2) C    3) D    4) B    5) C    6) B    7) A    8) C    9) D    10) B    11)  $\{x|x < -8\}$   
12)  $\{x|x > \frac{11}{3}\}$     13)  $\{x|x \leq -\frac{21}{8}\}$     14)  $w > 5$     15)  $x = -16$     16)  $x = -10$   
17)  $h = \frac{3V}{A}$     18) 160    19) 8.4

**Chapter 3**

- 1) B      2) D      3) C      4) C      5) D      6) 30 m.p.h.      7) 1,400 sportswriters  
 8) 53 meters by 120 meters      9) 4 liters of 18% salt solution and 8 liters of 45% salt solution  
 10) 137.5 pounds per square inch

**Chapter 4**

- 1) A      2) B      3) B      4) E      5) D  
 6) A line through the points (0,2), (4,-1) and (8,-4).  
 7) A line with a  $y$ -intercept of (0,2) and an  $x$ -intercept of (-6,0).  
 8) A vertical line through the points (-3,0), (-3,1) and (-3,2).  
 9) A line through the points (0,-4) and (3,-2).  
 10) The boundary is the broken line through (0,2) and (10,0) and the shaded half-plane is above the line.

**Chapter 5 (Selected problems)**

- 1) D      2) B      3) A      4) C      5) B      6) (-2, 6)      7) length = 80 feet, width = 40 feet  
 8) Each shirt costs \$8 and each blouse costs \$9

**Chapter 6**

- 1) C      2) A      3) D      4) B      5) D      6)  $-5x^3 + \frac{1}{2x^2} + 1$   
 7)  $3x^2 - 4x + 2 + \frac{3}{5x+3}$       8)  $\frac{1}{4x^2}$       9)  $\frac{9x^6}{100}$

**Chapter 7**

- 1) D      2) C      3) B      4) A      5)  $2x^3y^2(4x - 3y)(3x + 5y)$       6)  $-5x^2(x + 9)(x - 5)$   
 7)  $x(2y - 5)(4y^2 + 10y + 25)$       8)  $\left\{-\frac{3}{2}, \frac{4}{5}\right\}$       9) a) 320 feet      b) 8 seconds  
 10) a) 13" x 6"      b) 38 inches

**Chapter 8**

- 1) A      2) D      3) C      4) B      5)  $x + 6$       6)  $\frac{-5}{x - 5}$       7)  $\frac{-(x + 9)(x - 6)}{4}$       8) -2  
 9)  $\frac{2(5x - 1)}{x}$       10) 85 mph; 65 mph

**Chapter 9**

- 1) B      2) A      3) D      4) D      5)  $15 - 2\sqrt{2}$       6)  $2\sqrt{5} + \sqrt{2}$       7)  $5\sqrt{2} - 2$   
 8)  $x = 16$       9)  $4\sqrt{3} - 2$

**Chapter 10**

- 1) D      2) D      3) B      4) A      5) C      6)  $x = 0$  or  $x = -3$       7)  $\frac{49}{4}$   
 8)  $x = \frac{2 \pm \sqrt{22}}{3}$       9)  $x = -1 \pm \frac{\sqrt{10}}{2}$