

Dear Students,

Your 10<sup>th</sup> grade Algebra 2 class was packed with topics that are the foundation of the types of problems seen on the SAT and ACT math sections! As you move into 11<sup>th</sup> grade math, it is crucial that you have a solid grasp of these topics from the first 6 chapters of the textbook. The 11<sup>th</sup> grade math class will be continuing forward in the same textbook, and the skills learned in 10<sup>th</sup> grade math will be the foundation for success in 11<sup>th</sup> grade math and your upcoming standardized tests.

With that in mind, we have attached a list of the topics that were covered in 10<sup>th</sup> grade Algebra 2 this year. It is your responsibility to ensure that all of these topics are mastered, and that summer is not a time of “math-sliding.” Whether it is working with a study guide, getting a tutor or peer tutor, reviewing notes and tests, or using online resources, you should work with your parents to figure out the best way to shore up any topics that may be weak and to reinforce the rest. 11<sup>th</sup> grade gets very busy and preparation for the college application process will be building. Despite math being the last thing you want to focus on, summer math work can make a world of difference for you and your success in 11<sup>th</sup> grade! **We have provided an attached *optional* summer packet that we recommend you use as a starting point for your review.**

Mrs. Graff can be contacted through email by you or your parents to get direction as to which topics you should focus on this summer. Guidance and the math department can suggest options for books, tutoring, and online resources. An internet search on any of the topics from this year will provide you a wealth of options for quizzes, math explanations, video lessons, review problems, and the like. We look forward to a fantastic 11<sup>th</sup> grade year.

Have a great and productive summer!

Sincerely,

The Math Department

## 10<sup>th</sup> grade: Algebra 2 ~ Covered Topics 2017-2018

### Isolating Variables

Examples:

1. Solve  $ax + by = c$  for  $y$
2. Solve  $A = \frac{1}{2}h (b_1 + b_2)$  for  $b_1$
3. Solve  $A = \frac{1}{2}h (b_1 + b_2)$  for  $h$

### Absolute Value Equations

Examples:

1.  $9 = |6x - 3| + 1$
2.  $\frac{1}{3} |5y + 2| = 18$

### Solving Inequalities, including conjunctions, disjunctions and absolute values

Examples:

1.  $2(x - 3) - 4 < x - 6$
2.  $1 \leq 4x + 1 \leq 9$
3.  $3x + 8 \geq 15$  or  $2x - 6 < 9$
4.  $2x + 7 \geq 13$  or  $5x - 4 < 6$
5.  $2x + 7 \geq 13$  and  $5x - 4 < 6$
6.  $|4x + 4| > 6$
7.  $|5x - 2| < 16$

## Linear Equations

Graphing a line from an equation in either slope-intercept form or standard form (and going between these forms)  
Determining the slope of a line from an equation, a graph, or 2 points  
Finding the equation of a line given either 2 points, or 1 point and a slope  
Finding ordered pairs for a linear equation  
Writing equations and graphing horizontal and vertical lines  
Writing equations and graphing perpendicular and parallel lines  
Solving a system of 2 linear equations using the methods of graphing, linear combination, and substitution  
Graphing a system of 2 linear inequalities

## Functions

Identifying functions vs non-functions from a graph or ordered pairs  
Determining the domain and range from an equation or graph  
Writing a linear function given a subset of:  $x$ ,  $f(x)$ ,  $m$ ,  $b$

## Polynomials

Identifying the parts of a polynomials and types of polynomials  
Simplifying polynomials  
Adding and subtracting polynomials  
Finding the GCF and LCM of monomials  
Multiplying binomials (FOIL)  
Factoring: common factors, trinomials, perfect square trinomials, difference of squares binomials, difference of cubes binomials, and sum of cubes binomials  
Solving for  $x$  after factoring  
Solving polynomial inequalities  
Using exponent rules:  $a^n a^m = a^{n+m}$ ;  $(a^n)^m = a^{n \cdot m}$ ;  $(ab)^n = a^n b^n$ ;  $a^0 = 1$ ;  $a^1 = a$

## Rational Expressions

Simplifying rational expressions completely  
Finding the domain and zeroes  
Multiplying and dividing rational expressions  
Negative exponents  
Finding a common denominator to add and subtract rational expressions  
Simplifying complex fractions  
Solving equations with fractional coefficients  
Solving fractional equations  
Extraneous solutions

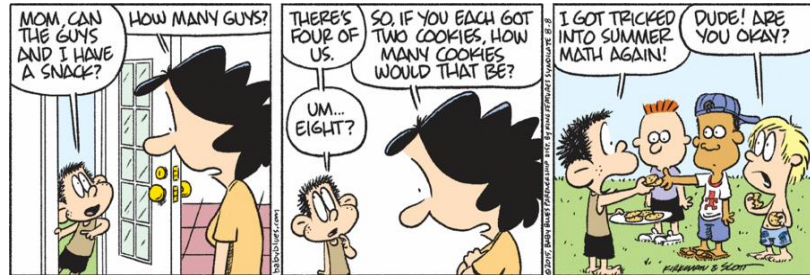
More exponent rules:  $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$  ;  
 $\frac{a^m}{b^n} = a^{m-n}$  (if  $m > n$ ) or  $\frac{1}{a^{n-m}}$  (if  $m < n$ ) or  $1$  (if  $m = n$ );  
 $a^{-n} = \frac{1}{a^n}$

## Irrational and Complex Numbers

Simplifying square roots, cube roots,  $n^{\text{th}}$  roots  
Properties of radicals  
Adding, subtracting, multiplying, dividing radical expressions  
Solving radical equations  
Rationalizing the denominator  
Imaginary and complex numbers

# Get ready for Advanced Algebra/Trigonometry with the *Optional but Highly Recommended* Summer Packet

To make the transition to next year easier, spend time this summer practicing and reviewing the Algebra topics in this packet.



**A. Evaluate using the Order of Operations:**

1.  $\frac{3xy^2 - 1}{3x^3y + 1}$  when  $x = -3, y = -2$

2.  $-x^2 - 4x$  when  $x = -1$

**B. Solve the equations:**

3.  $-3(3x + 2) = 6(-3 - 2x) - 2$

4.  $2(5x - 9) = 3 - 8(x + 2)$

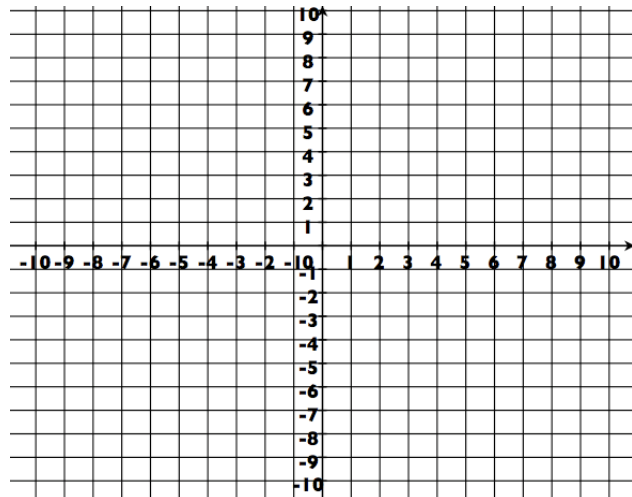
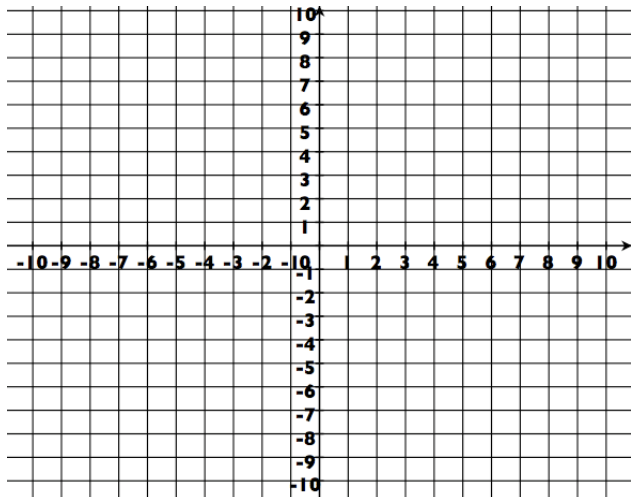
**C. Linear Equations:** Sketch graphs, write linear equations using slope and intercepts

5. In which quadrant is (5, -4)?

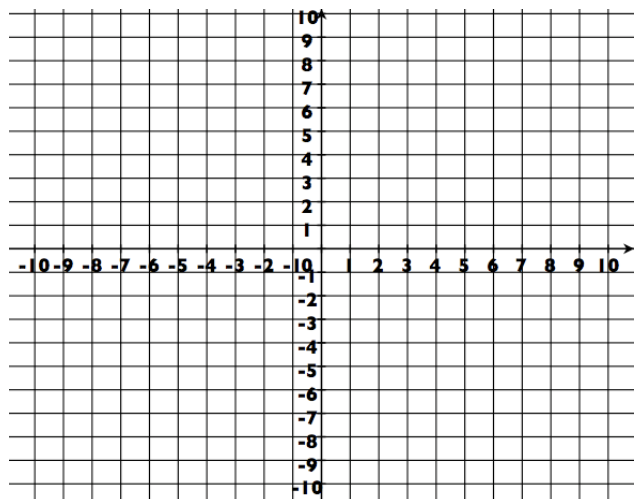
Sketch the graph of the following linear equations:

6.  $x = -5$

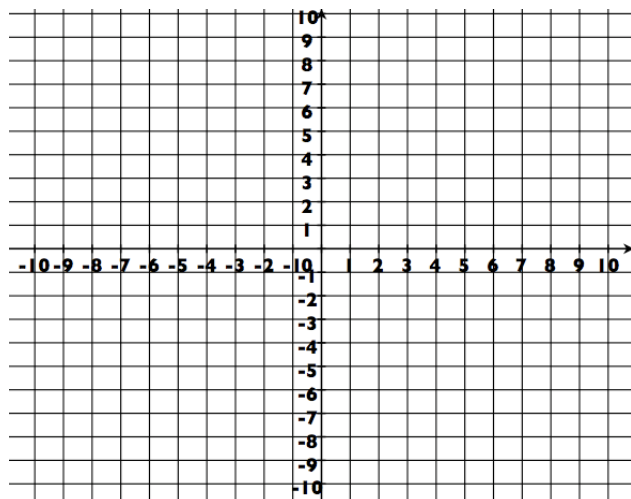
7.  $y = 3$



8.  $y = -3x + 5$



9.  $2x - 3y = 6$  (first, solve for y)



10. Find the slope of  $(-15, 11)$  and  $(8, -4)$

11. Find the intercepts of  $-4x - 3y = 16$

x- intercept: \_\_\_\_\_

y-intercept: \_\_\_\_\_

12. Rewrite in slope-intercept from:  $-4x - 3y = 1$

slope: \_\_\_\_\_

y-intercept: \_\_\_\_\_

13. Write an equation, in slope-intercept form, of the line containing  $(1, 1)$  and  $(2, -2)$ .

14. Write an equation of the line passing through  $(7, 2)$  and having a slope of 0.

15. Write an equation of the line having an undefined slope (no slope) and passing through the point  $(-2, 5)$

**D. Add, Subtract and Multiply Polynomials:**

16.  $(2x^2 + 3x - 4) - (x^2 + x - 1)$

17.  $(2x^2 - 3x) + (3x + 2) - 2(3x^2 - 2x)$

18.  $2x(4x^2 - 3x + 2)$

19.  $(4x - 7)(3x + 2)$

20.  $(2x - 5)^2$

21.  $(x - 3)(x^2 + 2x - 3)$

**E. Factoring:** Greatest Common Factor, Trinomials, and Difference of Squares

When you factor, first look for a GCF. Then look for special factors, like the difference of squares:  $a^2 - b^2 = (a + b)(a - b)$ , or the sum or difference of 2 cubes, or if there are four terms, factor by grouping. If you are factoring a trinomial, use whatever method that works best for you.

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2) \text{ difference of cubes}$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2) \text{ sum of cubes}$$

22.  $x^2 - 49$

23.  $x^2 + 4x - 21$

24.  $x^2 - 16x + 64$

25.  $2x^3 - 32x$

26.  $2x^2 - 5x - 12$

27.  $x^3 + 5x^2 - 9x - 45$

28.  $x^3 - 8$

29.  $18x^2y^5 - 30x^3y^4 + 3xy^3$

## F. Simplify Using Exponent Rules

$$30. (3)^4(3)^2$$

$$31. x^{-7} \cdot x^9$$

$$32. \frac{y^{15}}{y^5}$$

$$33. (-2x^2y^0)^4$$

$$34. (-5m)^0$$

$$35. \frac{y^4}{6x^3} \cdot \frac{12x^2}{xy}$$

$$36. \frac{5x^2}{y^{-3}} \cdot \frac{1}{15x^4y^{-1}}$$

$$37. (-2xy^3)^{-3}$$

## G. Quadratic Equations:

$$38. \text{Solve } \frac{1}{2}x^2 = 8$$

*In #39 - 40, solve using the quadratic formula and simplify.*

$$39. x^2 + 4x - 3 = 0$$

$$40. 3x^2 + 2x - 2 = 0$$

*In #41 - 42, solve by factoring and simplify.*

$$41. x^2 - 5x = 0$$

$$42. x^2 - 3x - 10 = 0$$

## H. Complex (Imaginary) Numbers:

*Simplify.*

43.  $\sqrt{-9}$

44.  $\sqrt{-7}$

45.  $-\sqrt{-4}$

46.  $-\sqrt{-15}$

47.  $(3i)^2$

48.  $-(2i)^2$

49.  $3i^2$

50.  $i^4$

*Solve the equation.*

51.  $x^2 = -9$

52.  $x^2 = -7$

*Perform the indicated operation.*

53.  $(9 + 3i) + (7 - i)$

54.  $(1 - 6i) - (8 + i)$

55.  $2i(5 + 3i)$

56.  $(5 + 4i)(2 + i)$

## I. Radicals and Rational Exponents

57. Write in radical form and simplify:  $9^{\frac{1}{2}}$

58. Write in rational exponent form:

a)  $6\sqrt[5]{x^3}$

b)  $\sqrt[5]{6x^3}$

59. Simplify, then add like radicals:

$\sqrt{18} + \sqrt{8} - 4\sqrt{2}$

*Simplify.*

60.  $\sqrt[3]{27x^3y^6}$

61.  $\sqrt{16x^5}$

62.  $4\sqrt{2x+3} = 7$

63.  $\sqrt[3]{3x} = \sqrt[3]{x-4}$

64.  $2\sqrt{x-3} = -7$

65.  $\sqrt{2x-3} = \sqrt{4x-7}$

**Common Errors in Algebra**

Many Algebra errors come from not mastering the differences between the rules of addition and multiplication! Test yourself by doing the following problems. Check your answers by substituting numbers for the variables. There may be more than one correct form of the answer.

**I. Errors Involving Parentheses**

A. Distributing a negative sign

1.  $3 - (x - 2) =$

a.  $3 - x - 2$

b.  $1 - x$

c.  $5 - x$

2.  $\frac{3x}{x+2} - \frac{x+1}{x+2} =$

a.  $\frac{2x+1}{x+2}$

b.  $\frac{2x-1}{x+2}$

3.  $\frac{3x+2}{5x} - \frac{2(x+1)}{5x}$

a.  $\frac{1}{5}$

b.  $\frac{x+1}{5x}$

c.  $\frac{x+4}{5x}$

B. Distributing Left and Right

1.  $4(x+2) \cdot 2$

a.  $8x+16$

b.  $4x+4$

c.  $4x+16$

C. DO NOT distribute exponents over addition or subtraction

Does  $(a+b)^2 = a^2 + b^2$ ?

Convince yourself: Does  $(3+4)^2 = 3^2 + 4^2$ ?

D. DO NOT distribute when there is only multiplication

1.  $\left(\frac{1}{2}\right)(ab)$

a.  $\left(\frac{1}{2}a\right)\left(\frac{1}{2}b\right)$

b.  $\left(\frac{1}{2}\right)ab$

c.  $\frac{1}{2}ab$

d.  $\frac{ab}{2}$

**II. Errors Involving Fractions**

1. Does  $\frac{a+b}{x} = \frac{a}{x} + \frac{b}{x}$ ?

Does  $\frac{x}{a+b} = \frac{x}{a} + \frac{x}{b}$ ?

2.  $\frac{1}{a} + \frac{1}{b} =$

a.  $\frac{1}{a+b}$

b.  $\frac{b+a}{ab}$



3.  $\frac{x/a}{b} =$

a.  $\frac{bx}{a}$

b.  $\frac{x}{ab}$

4.  $\left(\frac{1}{3}\right)x =$

a.  $\frac{1}{3x}$

b.  $\frac{x}{3}$

5.  $\frac{1}{x} + 2 =$

a.  $\frac{1}{x+2}$

b.  $\frac{1+2x}{x}$

6.  $\frac{x+1}{x+1} =$

a. 1

b. 0

7.  $\frac{(x+1)}{(x+1)(x+3)} =$

a.  $\frac{1}{x+3}$

b.  $x+3$

8. Which are the possible steps for simplifying the following expression on a calculator?

$\frac{50}{5 \times 2}$

a.  $50 \div 5 \times 2$

b.  $50 \div 5 \div 2$

c.  $50 \div (5 \times 2)$

### III. Errors Involving Exponents

1.  $(x^2)^3$

a.  $x^5$

b.  $x^6$

2.  $x^3 \cdot x^5$

a.  $x^8$

b.  $x^{15}$

3. Does  $4x^2 - 2x^2 = 4x^2 - (2x)^2$ ?

4.  $\frac{9}{5x^3}$

a.  $\frac{9}{5}(x^{-3})$

b.  $\frac{9}{5}(x^3)$

5.  $\frac{7}{\sqrt{2x-3}}$

a.  $7(2x-3)^{\frac{1}{2}}$

b.  $7(2x-3)^{-\frac{1}{2}}$

6. Which are the correct steps when using the calculator?  $2^{2 \cdot 3}$

a.  $2^{\wedge}2 \times 3$

b.  $2^{\wedge}(2 \times 3)$

### IV. Errors Involving Radicals

1.  $\sqrt{5x}$

a.  $5\sqrt{x}$

b.  $\sqrt{5x}$

c.  $\sqrt{5} \cdot \sqrt{x}$

2. Does  $\sqrt{a^2 + b^2} = a + b$ ?

**Check:** Does  $\sqrt{3^2 + 4^2} = 3 + 4$

3. Does  $\sqrt{(a+b)^2} = a+b$ ?

**Check:** Does  $\sqrt{(3+4)^2} = 3+4$

4.  $\frac{\sqrt{64}}{2}$

a.  $\sqrt{32}$

b.  $\frac{8}{2}$  or 4

5.  $\frac{\sqrt{32}}{2}$

a.  $\sqrt{16}$

b.  $\frac{4\sqrt{2}}{2}$  or  $2\sqrt{2}$

### V. Errors Involving Dividing Out Common Factors

1.  $\frac{a+bx}{a}$

a.  $1+bx$

b.  $1+\left(\frac{b}{a}\right)x$

c.  $1+\frac{bx}{a}$

2.  $\frac{a+ax}{a}$

a.  $a+x$

b.  $1+x$

3.  $\frac{2\pm 4\sqrt{3}}{2}$

a.  $2\pm 2\sqrt{3}$

b.  $1\pm 2\sqrt{3}$

c.  $1\pm 4\sqrt{3}$

4.  $\frac{12\pm 2\sqrt{3}}{6}$

a.  $2\pm \frac{\sqrt{3}}{3}$

b.  $12\pm \frac{\sqrt{3}}{3}$

c.  $2\pm 2\sqrt{3}$

5.  $\frac{4x}{x-4}$

a.  $\frac{x}{1-4}$

b.  $-1$

c. Can't simplify

6.  $\frac{8x}{2x-4}$

a.  $\frac{4x}{x-2}$

b.  $-1$

c. Can't simplify

## Formulas you should be comfortable using

Slope of a line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Slope-Intercept Form of a Line

$$y = mx + b$$

Point-Slope Form of a Line

$$(y - y_1) = m(x - x_1)$$

Vertex Form of a Quadratic

$$y = a(x - h)^2 + k$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Discriminant

$$b^2 - 4ac$$

x-coordinate of the Vertex of a Parabola

$$x = \frac{-b}{2a}$$

Pythagorean Theorem

$$a^2 + b^2 = c^2$$

Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint Formula

$$\left( \frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right)$$

Direct Variation

$$y = kx \text{ or } \frac{y}{x} = k$$

Inverse Variation

$$y = \frac{k}{x} \text{ or } xy = k$$

Joint Variation

$$z = kxy$$

Difference of Two Cubes

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Sum of Two Cubes

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

## Answer Key

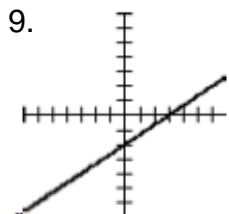
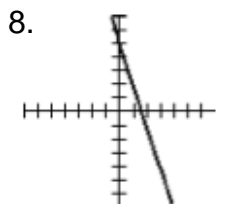
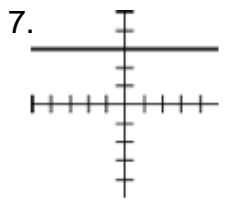
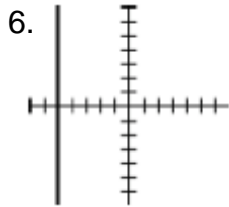
1.  $\frac{-37}{163} \approx -0.227$

2. 3

3.  $x = \frac{-14}{3}$

4.  $x = \frac{5}{18}$

5. IV



10.  $m = \frac{-15}{23}$

$x$  - int : -4

11.  $y$  - int :  $\frac{-16}{3}$

12. slope :  $\frac{-4}{3}$

$y$  - int :  $\frac{-1}{3}$

13.  $y = -3x + 4$

14.  $y = 2$

15.  $x = -2$

16.  $x^2 + 2x - 3$

17.  $-4x^2 + 4x + 2$

18.  $8x^3 - 6x^2 + 4x$

19.  $12x^2 - 13x - 14$

20.  $4x^2 - 20x + 25$

21.  $x^3 - x^2 - 9x + 9$

22.  $(x + 7)(x + 7)$

23.  $(x + 7)(x - 3)$

24.  $(x - 8)^2$

25.  $2x(x + 4)(x - 4)$

26.  $(2x + 3)(x - 4)$

27.  $(x + 3)(x - 3)(x + 5)$

28.  $(x - 2)(x^2 + 2x + 4)$

29.  $3xy^3(6xy^2 - 10x^2y + 1)$

30. 729

31.  $x^2$

32.  $y^{10}$

33.  $16x^8$

34. 1

35.  $\frac{2y^3}{x^2}$

36.  $\frac{y^4}{3x^2}$

37.  $\frac{1}{-8x^3y^9}$

38.  $x = \pm 4$

39.  $x = -2 \pm \sqrt{7}$

40.  $x = \frac{-2 + \sqrt{28}}{6} = \frac{-1 \pm \sqrt{7}}{3}$

41.  $x(x - 5) = 0; x = 0, 5$

42.  $(x - 5)(x + 2) = 0; x = 5, -2$

43.  $3i$

44.  $i\sqrt{7}$

45.  $-2i$

46.  $-i\sqrt{15}$

47.  $9i^2 = -9$

48. 4

49. -3

50. 1

51.  $x = \pm 3i$

52.  $x = \pm i\sqrt{7}$

53.  $16 + 2i$

54.  $-7 - 7i$

55.  $10i + 6i^2 = -6 + 10i$

56.  $10 + 13i + 4i^2 = 6 + 13i$

57.  $\sqrt{9} = 3$

58. a)  $6x^{\frac{3}{5}}$  b)  $(6x^3)^{\frac{1}{5}}$

59.  $3\sqrt{2} + 2\sqrt{2} - 4\sqrt{2} = \sqrt{2}$

60.  $3xy^2$

61.  $4x^2\sqrt{x}$

62.  $\sqrt{2x} = 1$  so  $x = \frac{1}{2}$

63.  $3x = x - 4$  so  $x = -2$

64. no solution

65.  $2x - x = 4x - 7$  so  $x = 2$

## Answers to *Common Errors in Algebra*

- I.** A. 1. c 2. b 3. a  
B. 1. a  
C. NO!  
D. 1. b, c, or d

- II.** 1. Yes, No  
2. b  
3. b  
4. b  
5. b  
6. a  
7. a  
8. b or c

- III.** 1. b  
2. a  
3. NO!  
4. a  
5. b  
6. b

- IV.** 1. c  
2. NO!  
3. Yes  
4. b  
5. b

- V.** 1. b or c  
2. b  
3. b  
4. a  
5. c  
6. a