

**Elgin High School 2022 Summer Packet**  
**\*\*Required for all Honors/Gifted PreCalculus students.\*\***

*The PreCalculus course prepares students for Calculus and college science courses. In order to accomplish this, the course is taught at a significantly faster pace than Algebra 2, and students often find it difficult to adjust. You will need to spend time this summer practicing and reviewing the Algebra 1 and 2 topics in this packet!*

**\*\*You will be given a Quiz based on the contents of this packet at the beginning of your PreCalculus course.\*\***

**There is a formula sheet at the end of the packet.**

If you are unsure how to do any problem, check for online help, such as Khan Academy.

A. Evaluate using 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 equations:

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

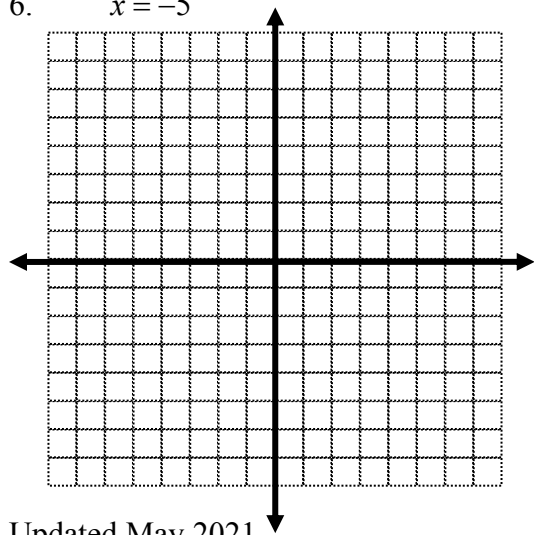
4.  $2(5x - 9) = 3 - 8(x + 2)$

C. Linear Equations - Sketch graphs, write linear equations using slope and intercept:

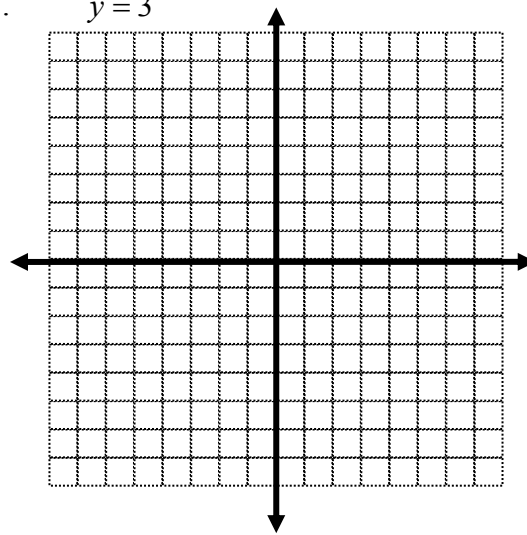
5. In which quadrant is (5, -4)?

Sketch the graph of the following linear equations:

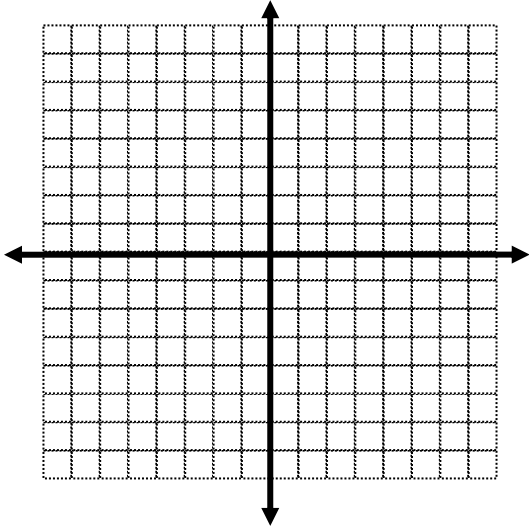
6.  $x = -5$



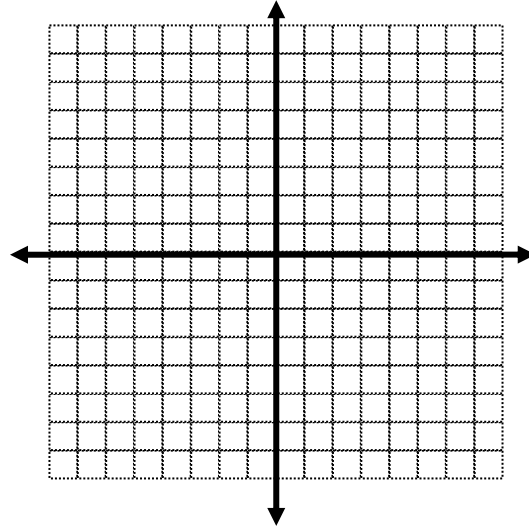
7.  $y = 3$



8.  $y = -3x + 5$



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



10. Find the slope of  $(-15, 11)$  and  $(8, -4)$       \*\* (formula sheet at the end)

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

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

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

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

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

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

13. Write an equation 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, Difference of Squares:

When you factor, first look for a **GCF**.

Then look for **special factors**, like the **difference of 2 squares**:

$$a^2 - b^2 = (a + b)(a - b),$$

OR the **sum or difference of 2 cubes** (formulas are on the last page)

OR, if there are 4 terms, **factor by grouping**.

If you are factoring a trinomial, either factor by trial and error, or perhaps you remember "splitting the middle term" and using grouping.

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. Solve  $\frac{1}{2}x^2 = 8$ . (Isolate and use square root property)

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

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

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

In #41-42, **factor** to find all **real** solutions:

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

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

## H. Complex (Imaginary) Numbers:

Simplify the following:

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:  $9^{1/2}$

58. Write in rational exponent form: a.)  $6^5\sqrt{x^3}$  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.  $\sqrt{16x^5}$

**Solve** (check for extraneous solutions):

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

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

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

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

**J. Rational Expressions:**

66. Divide Rational Expressions (Multiply by Reciprocal, Factor, Simplify)

$$\frac{x^2 + 6x + 8}{x^2 + 3x} \div \frac{x^2 + x - 2}{4x^2 + 12x}$$

67. Simplify Complex Fractions using the LCD Method (Video - <http://tinyurl.com/z67adhs> )

$$\frac{\frac{2}{3x}}{\frac{1}{2} + \frac{5}{3x}}$$

68. Simplify Complex Fractions - Multiply by the Reciprocal Method (Video - <http://tinyurl.com/j2pq7jy> )

$$\frac{\frac{1}{x} + \frac{3}{x+1}}{\frac{3}{x-1} + \frac{1}{x}}$$

### Section 3 - 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.  $4(x+2)(2) =$       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.  $\left(\frac{1}{2}\right)(a)(b) =$     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

$$7. \frac{(x+1)}{(x+1)(x+3)} = \quad \text{a) } \frac{1}{x+3} \quad \text{b) } x+3$$

$$8. \text{ Which are possible steps for doing on a calculator } \frac{50}{(5)(2)}?$$

$$\text{a) } 50 \div 5 \times 2 \quad \text{b) } 50 \div 5 \div 2 \quad \text{c) } 50 \div (5 \times 2)$$

### III. ERRORS INVOLVING EXPONENTS

$$1. (x^2)^3 = \quad \text{a) } x^5 \quad \text{b) } x^6$$

$$2. x^3 \cdot x^5 = \quad \text{a) } x^8 \quad \text{b) } x^{15}$$

$$3. \text{ Does } 4x^2 - 2x^2 = 4x^2 - (2x)^2?$$

$$4. \frac{9}{5x^3} = \quad \text{a) } \frac{9}{5}(x^{-3}) \quad \text{b) } \left(\frac{9}{5}\right)x^3$$

$$5. \frac{7}{\sqrt{2x-3}} = \quad \text{a) } 7(2x-3)^{1/2} \quad \text{b) } 7(2x-3)^{-1/2}$$

$$6. \text{ Which are correct steps for doing on a calculator } 2^{2 \cdot 3}?$$

$$\text{a) } 2^2 \times 3 \quad \text{b) } 2^{(2 \times 3)}$$

### IV. ERRORS INVOLVING RADICALS

$$1. \sqrt{5x} = \quad \text{a) } 5\sqrt{x} \quad \text{b) } \sqrt{5}x \quad \text{c) } \sqrt{5} \cdot \sqrt{x}$$

$$2. \text{ Does } \sqrt{a^2 + b^2} = a + b? \quad \text{Check: Does } \sqrt{3^2 + 4^2} = 3 + 4?$$

$$3. \text{ Does } \sqrt{(a+b)^2} = a + b? \quad \text{Check: Does } \sqrt{(3+4)^2} = 3 + 4?$$

$$4. \frac{\sqrt{64}}{2} = \quad \text{a) } \sqrt{32} \quad \text{b) } \frac{8}{2} \text{ or } 4$$

$$5. \frac{\sqrt{32}}{2} = \quad \text{a) } \sqrt{16} \quad \text{b) } \frac{4\sqrt{2}}{2} \text{ or } 2\sqrt{2}$$

$$6. \text{ Which are correct calculator steps for } \sqrt{3^2 + 4^2}?$$

$$\text{a) } \sqrt{3^2} + \sqrt{4^2} \quad \text{b) } \sqrt{(3^2 + 4^2)}$$

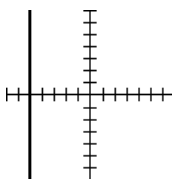
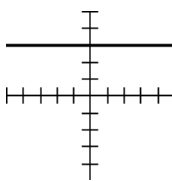
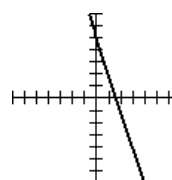
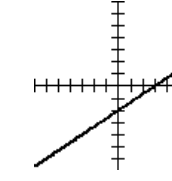
$$\text{c) } (3^2 + 4^2)^{1 \div 2} \quad \text{d) } (3^2 + 4^2)^{(1 \div 2)}$$



**V. ERRORS INVOLVING DIVIDING OUT COMMON FACTORS****A. When Simplifying Fractions**

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

### Answer Key – Are you ready for Algebra 3/Trig

1.  $\frac{-37}{163} \approx -.227$
2. 3
3.  $x = \frac{-14}{3}$
4.  $x = \frac{5}{18}$     5. IV
6. 
7. 
8. 
9. 
10.  $m = \frac{-15}{23}$
11.  $x$ -int:  $-4$   
 $y$ -int:  $-16/3$
12. slope:  $-4/3$   
 $y$ -int:  $-1/3$
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.  $x = \frac{-2 \pm \sqrt{28}}{6} = \frac{-1 \pm \sqrt{7}}{3}$
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)  $6x^{3/5}$     b)  $(6x^3)^{1/5}$
59.  $3\sqrt{2} + 2\sqrt{2} - 4\sqrt{2} = \sqrt{2}$
60.  $3xy^2$
61.  $4x^2\sqrt{x}$
62.  $x^2 = 2x + 3$  so  $(x - 3)(x + 1) = 0$   
So  $x = 3$  ( $x \neq -1$ , extraneous)
63.  $3x = x - 4$  so  $x = -2$
64. no solution
65.  $2x - 3 = 4x - 7$  so  $x = 2$
66.  $\frac{4(x + 4)}{x - 1}$
67.  $\frac{4}{3x + 10}$
68.  $\frac{(4x + 1)(x - 1)}{(x + 1)(4x - 1)}$

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

**Answers to *Common Errors in Algebra***

- I.**
- A.** 1. c 2. b 3. a
  - B.** 1. a
  - C.** NO!!!
  - D.** 1. b or 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
  - 6. b or d
- V. A.**
- 1. b or c
  - 2. b
  - 3. b
  - 4. a
  - 5. c
  - 6. a

## ALGEBRA II FORMULA SHEET

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 Formula	$(y - y_1) = m(x - x_1)$
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	$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$