

**ADVANCED ALGEBRA
SUMMER WORK**

YOUR NAME: _____

Directions: The concepts covered in this packet are skills that students should have mastered in Algebra 1. If you are drawing a blank, please refer to the problems that have already been completed for you.

Rationale: The math course you are starting on August 15th has some high expectations. It is assumed you can...

- (1) follow order of operations appropriately in all situations
- (2) solve a variety of linear and quadratic equations as well as inequalities
- (3) graph basic linear functions
- (4) factor, factor, factor
- (5) simplify square roots/radicals
- (6) follow the rules of exponents
- (7) use and understand basic function notation

To refresh on these topics, you'll need to practice these skills in the weeks leading up to the beginning of the 2019-2020 school year.

Resources: For each even numbered problem you need to complete, there is an odd-numbered example problem worked out in detail. If that's not enough to guide your work, then we suggest you google the topic you are struggling with or go to one of the following websites & search the topic...

<https://www.khanacademy.org/>

<http://www.purplemath.com/>

<http://www.mathgoodies.com/students.html>

This packet will count as your first grade for the course and is due the FIRST day of school (August 14th). You will also take a NO CALCULATOR quiz on this material on the THIRD day of class (August 16th). Make sure you start off the year on the right foot!

(OVER)

Requirement: A requirement of this course is that you purchase a graphing calculator. Although these can be expensive, we will use it in every chapter to supplement the content that is being learned. Below are *suggested* calculators that are appropriate to use in Advanced Algebra and can be used in subsequent years through college level math courses.

TI - 83+



If you purchase a TI - 83, it needs to be a plus (+) model. You will need the blue/purple "APPS" key.

This is the button we are looking for.

TI - 84/TI - 84+



These calculators come in various models, as they have been updated over the years. ANY TI - 84 is appropriate. It can be a plus (+) model, a C or CE model or a silver edition model. It can also have a black and white screen or a color screen. The most efficient calculators are the newest thinner calculators with a color screen.

It is highly recommended to purchase one of these calculators as soon as possible, as they do sell out quickly at the beginning of the school year.

Thank you,

Mr. Strzelczyk
Ms. Coletta
Mr. Chelmecki
Ms. Tello

(Willowbrook - Advanced Algebra Teachers 2019-2020)

#1 - 10: Evaluate.

1. $4 + 3 \cdot 4 + 2 - 9$

$$4 + \underline{12} \div 2 - 9$$

$$\underline{4 + 6} - 9$$

$$10 - 9$$

1

3. $4 + 3(5 - 6)^2$

$$4 + 3 \underline{(-1)^2}$$

$$4 + \underline{3(1)}$$

$$4 + 3$$

7

5. $(2x)^2 - y$ when $x = 3$, $y = 17$

$$\underline{(2 \cdot 3)^2} - 17$$

$$\underline{(6)^2} - 17$$

$$36 - 17$$

19

7. $\frac{1}{2}(x - 7) - 3x$ when $x = -11$

$$\frac{1}{2} \underline{(-11 - 7)} - 3(-11)$$

$$\frac{1}{2} \underline{(-18)} - \underline{3(-11)}$$

$$-9 + 33$$

24

9. $\frac{3b - a}{b + a}$ when $a = 3$, $b = -4$

$$\underline{3(-4)} - 3$$

$$-4 + 3$$

$$\underline{-12 - 3}$$

$$-4 + 3$$

$$\frac{-15}{-1}$$

15

2. $18 - 12 + 6 \cdot 2 - 10$

4. $20 - (7 + (-9))^2 \cdot 3$

6. $3x - 4y^3$ when $x = 7$, $y = -1$

8. $b^2 - 4ac$ when $a = 2$, $b = -3$, $c = -1$

10. $\frac{4b + 2a}{2b}$ when $a = 3$, $b = -4$

#11 - 18: Simplify.

11. $\underline{x} - \underline{x^2} + \underline{3x^2} + \underline{5x}$

$$\boxed{2x^2 + 6x}$$

13. $6y - 2(3y - 8) + 2y$

$$\underline{6y} - \underline{6y} + \underline{16} + \underline{2y}$$

$$\boxed{2y + 16}$$

15. $(4+x)(x-3)$

$$\underline{4x} - \underline{12} + \underline{x^2} - \underline{3x}$$

$$\boxed{x^2 + x - 12}$$

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

$$4 + \underline{6x} + \underline{6x} + 9x^2$$

$$\boxed{9x^2 + 12x + 4}$$

12. $4x^2 - 3x + 5x - 6x^2$

14. $5m - 3m(m+2) + 5m^2$

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

18. $(2x-5)^2$

#19 - 38: Solve.

19. $4x - 3 = 9$

$$\underline{+3} \quad \underline{+3}$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$\boxed{x = 3}$$

20. $3 - 5x = 16$

21. $3x - 6 = 5x + 12$

$$\underline{-3x} \quad \underline{-3x}$$

$$\underline{-6} = \underline{2x} + \underline{12}$$

$$\underline{-12} \quad \underline{-12}$$

$$\frac{-18}{2} = \frac{2x}{2}$$

$$\boxed{-9 = x}$$

22. $16 - 8x = 4x + 6$

23. $-3(2x+5) = 20$

$$\underline{-6x} - \underline{15} = 20$$

$$\underline{+15} \quad \underline{+15}$$

$$\frac{-6x}{-6} = \frac{35}{-6}$$

$$\boxed{x = -\frac{35}{6}}$$

24. $4(3x-7) = -40$

$$25. \quad 2(4-x) = 16 + 2x$$

$$\begin{array}{r} 8 - 2x = 16 + 2x \\ +2x \quad +2x \end{array}$$

$$\begin{array}{r} 8 = 16 + 4x \\ -16 \quad -16 \end{array}$$

$$\begin{array}{r} -8 = 4x \\ 4 \quad 4 \end{array}$$

$$\boxed{-2 = x}$$

$$27. \quad 4 - 3(4x+6) = 1$$

$$\underline{4} - 12x - \underline{18} = 1$$

$$\begin{array}{r} -12x - 14 = 1 \\ +14 \quad +14 \end{array}$$

$$\begin{array}{r} -12x = 15 \\ -12 \quad -12 \end{array}$$

$$\boxed{x = -\frac{5}{4}}$$

$$29. \quad 5(3x-2) + 10 = 2(5-6x)$$

$$15x - \underline{10} + \underline{10} = 10 - 12x$$

$$\begin{array}{r} 15x = 10 - 12x \\ +12x \quad +12x \end{array}$$

$$\begin{array}{r} 27x = 10 \\ 27 \quad 27 \end{array}$$

$$\boxed{x = \frac{10}{27}}$$

$$30. \quad \left(\frac{2}{3}m + 5 = 4m - 9\right) \cdot 3$$

$$\begin{array}{r} 2m + 15 = 12m - 27 \\ -2m \quad -2m \end{array}$$

$$\begin{array}{r} 15 = 10m - 27 \\ +27 \quad +27 \end{array}$$

$$\begin{array}{r} 42 = 10m \\ 10 \quad 10 \end{array}$$

$$\boxed{\frac{21}{5} = m}$$

$$26. \quad 5x - 20 = 6(2x + 1)$$

$$28. \quad 18 = 10 - 2(2x + 3)$$

$$30. \quad 20 + 8(3 + 4x) = -3(6x - 5)$$

$$32. \quad 4 - \frac{5}{6}x = \frac{1}{2}x + 2$$

#39 - 44: Solve and graph on a number line.

$$33. \begin{array}{r} x+4 \geq 7 \\ -4 \quad -4 \end{array}$$

$$\boxed{x \geq 3}$$



$$34. x - 3 < 5$$

$$35. \begin{array}{r} 2x+5 \leq -9 \\ -5 \quad -5 \end{array}$$

$$\frac{2x}{2} \leq \frac{-14}{2}$$

$$\boxed{x \leq -7}$$



$$36. 4 + 3x \geq 19$$

$$37. \begin{array}{r} 3-x < 6 \\ -3 \quad -3 \end{array}$$

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

$$\boxed{x > -3}$$



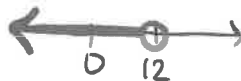
$$38. 2 - 3x \geq 14$$

$$39. \begin{array}{r} 5x-6 < 3x+18 \\ -3x \quad -3x \end{array}$$

$$\begin{array}{r} 2x-6 < 18 \\ +6 \quad +6 \end{array}$$

$$\frac{2x}{2} < \frac{24}{2}$$

$$\boxed{x < 12}$$



$$40. 3x + 5 > 6x - 12$$

$$41. \begin{array}{r} 5 < 3+2x \leq 11 \\ -3 \quad -3 \quad -3 \end{array}$$

$$\frac{2}{2} < \frac{2x}{2} \leq \frac{8}{2}$$

$$\boxed{1 < x \leq 4}$$



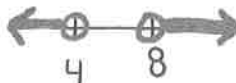
$$42. 19 > 5 - 2x > -7$$

$$43. \begin{array}{r|l} 4+2x < 12 & \text{or} & 5-2x < -11 \\ -4 \quad -4 & & -5 \quad -5 \end{array}$$

$$\frac{2x}{2} < \frac{8}{2}$$

$$\frac{-2x}{-2} < \frac{-16}{-2}$$

$$\boxed{x < 4 \quad \text{or} \quad x > 8}$$



$$44. 3 - 6x > 15 \text{ or } 5x - 3 \geq 12$$

45. Find the slope between (3,4) & (-2,5)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 4}{-2 - 3} = \frac{1}{-5} = \boxed{-\frac{1}{5}}$$

47. Write in slope-intercept form: $y = mx + b$

$$\begin{array}{r} 3x - 2y = 4x - 7 \\ -3x \quad -3x \\ \hline \end{array}$$

$$\frac{-2y}{-2} = \frac{x - 7}{-2}$$

$$\boxed{y = -\frac{1}{2}x + \frac{7}{2}}$$

49. Find the x and y - intercepts of $3x + 2y = 12$

X-int: $y = 0$

$$3x + 2(0) = 12$$

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

$$\boxed{(4, 0)}$$

Y-int: $x = 0$

$$3(0) + 2y = 12$$

$$\frac{2y}{2} = \frac{12}{2}$$

$$y = 6$$

$$\boxed{(0, 6)}$$

51. Find the slope of $3x - 2y = 6$ $y = \boxed{m}x + b$

$$\begin{array}{r} 3x - 2y = 6 \\ -3x \quad -3x \\ \hline \end{array}$$

$$\frac{-2y}{-2} = \frac{-3x + 6}{-2}$$

$$y = \frac{3}{2}x - 3$$

$$\boxed{m = \frac{3}{2}}$$

#53 - 72: Factor.

53. $\frac{21xy}{7x} - \frac{14xz}{7x}$ GCF

$$\boxed{7x(3y - 2z)}$$

55. $\frac{4x^2y^2z}{2xz} + \frac{6xz^2}{2xz}$ GCF

$$\boxed{2xz(2xy^2 + 3z)}$$

Factoring can **always** be checked by multiplying your answer back out (using FOIL or distributive property) to make sure you get the original expression.

46. Find the slope between (-6,7) & (3,-5)

48. Write in slope-intercept form:
 $4y - 6x = 5y - 12$

50. Find the x and y - intercepts of $4x - 6y = -20$

52. Find the slope of $5 - 7x - 5y = 7$

54. $18a^3 + 4a^2$

56. $24x^4y^5 - 8x^3y^7 + 4x^2y^8$

#73 - 78: Solve by using the quadratic formula.

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

73. $x^2 + 15x + 54 = 0$ $a=1$ $b=15$ $c=54$

$$x = \frac{-15 \pm \sqrt{(15)^2 - 4(1)(54)}}{2(1)} = \frac{-15 \pm \sqrt{9}}{2}$$

$$= \frac{-15 \pm 3}{2} = \frac{-12}{2} \text{ or } \frac{-18}{2} = \boxed{-6 \text{ or } -9}$$

74. $x^2 + 5x - 66 = 0$

75. $6x^2 + x - 35 = 0$ $a=6$ $b=1$ $c=-35$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(6)(-35)}}{2(6)} = \frac{-1 \pm \sqrt{841}}{12}$$

$$= \frac{-1 \pm 29}{12} = \frac{28}{12} \text{ or } \frac{-30}{12} = \boxed{\frac{7}{3} \text{ or } -\frac{5}{2}}$$

76. $12x^2 - 26x + 12 = 0$

77. $x^2 - 6x = 4$

$x^2 - 6x - 4 = 0$ $a=1$ $b=-6$ $c=-4$

78. $x^2 - 8x = 6$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(-4)}}{2(1)} = \frac{6 \pm \sqrt{52}}{2}$$

$$= \frac{6 \pm \sqrt{4} \sqrt{13}}{2} = \frac{6 \pm 2\sqrt{13}}{2} = \boxed{3 \pm \sqrt{13}}$$

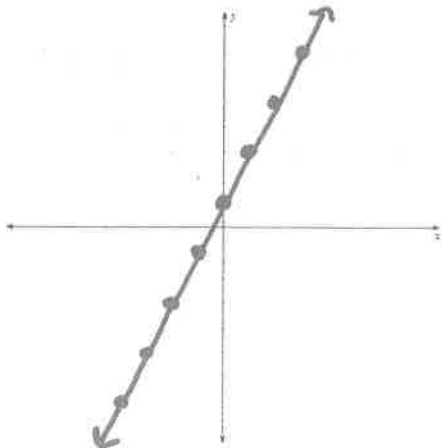
exact approximate

#79 - 86: Graph.

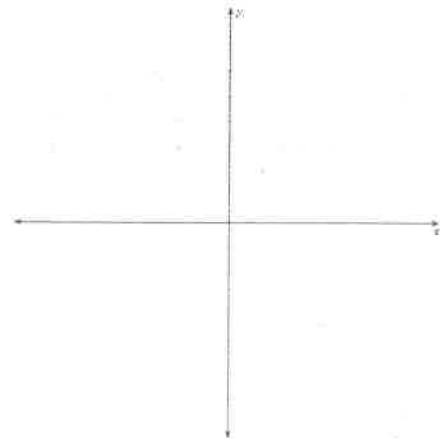
79. $y = 2x + 1$

y-int: $(0, 1)$

$m = 2$



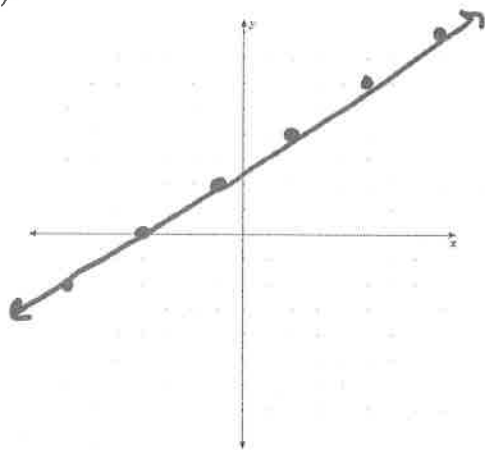
80. $y = -\frac{3}{4}x - 2$



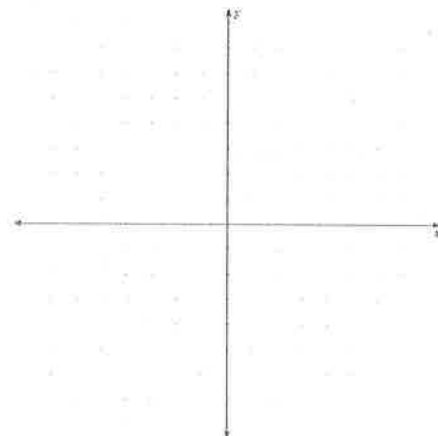
81. $y - 2 = \frac{2}{3}(x + 1)$

$x: (-1, 2)$

$m = \frac{2}{3}$



82. $y + 3 = -\frac{3}{4}(x - 4)$



83. $2x + 3y = 6$

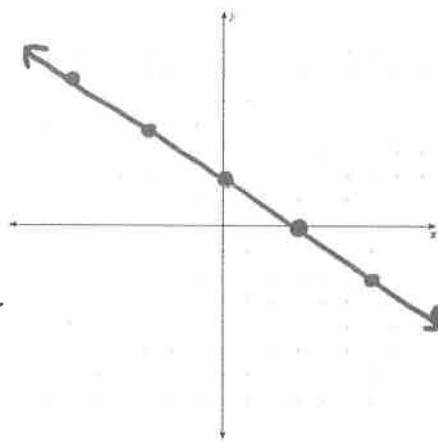
x	y
0	2
3	0

$2(0) + 3y = 6$

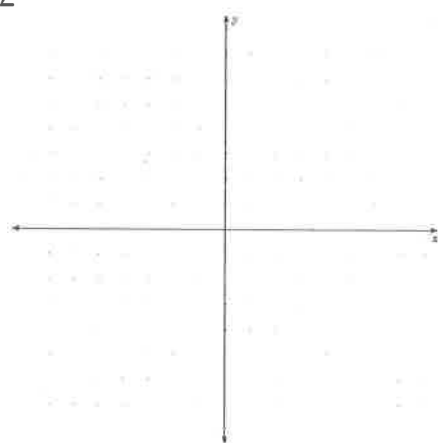
$\frac{3y}{3} = \frac{6}{3} \quad y = 2$

$2x + 3(0) = 6$

$\frac{2x}{2} = \frac{6}{2} \quad x = 3$



84. $3y + 4x = -12$

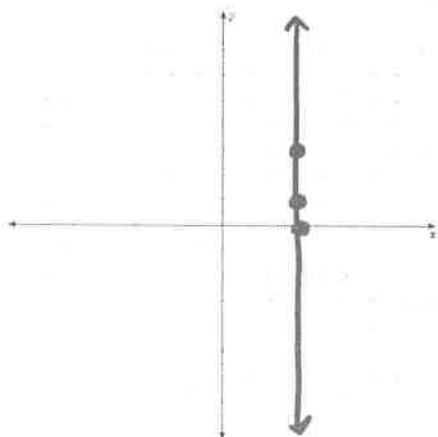


85. $x = 3$

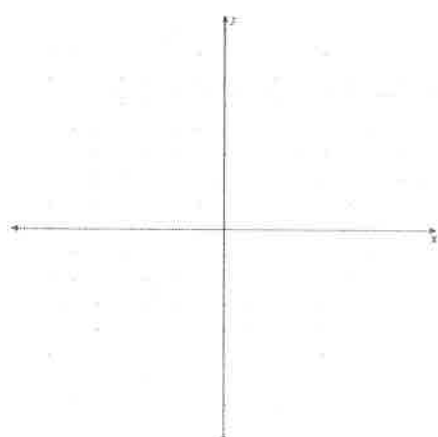
$(3, 0)$

$(3, 1)$

$(3, 4)$



86. $y = -4$



#87 - 92: Simplify the square root. 4, 9, 16, 25, 36, 49, 64, 81, 100, ...

87. $\sqrt{50} = \sqrt{25} \sqrt{2}$
 $= \boxed{5\sqrt{2}}$

88. $\sqrt{98}$

89. $\sqrt{90} = \sqrt{9} \sqrt{10}$
 $= \boxed{3\sqrt{10}}$

90. $\sqrt{132}$

$$91. \sqrt{72} = \sqrt{36} \sqrt{2}$$

#93 - 100: Use the properties/rules of exponents to simplify the expression.

$$93. 3x^2 \cdot 7x^5$$

multiply coefficients
add exponents

$$= 21x^7$$

$$92. \sqrt{675}$$

$$94. 10x^3 \cdot 4x^{-1}$$

$$95. (x^{-3}y^3)^2$$

$$= x^{-6}y^6 = \frac{y^6}{x^6}$$

multiply exponents
negative exponents = reciprocal

$$96. (x^4y^{-1})^5$$

$$97. \frac{x^7y^3}{x^5y^6}$$

$$= \frac{x^2}{y^3}$$

subtract exponents

$$98. \frac{y^3z^6}{yz^2}$$

$$99. \left(\frac{3a^4b^3}{c^7} \right)^{-2} = \frac{3^{-2}a^{-8}b^{-6}}{c^{-14}} = \frac{c^{14}}{9a^8b^6}$$

$$100. \left(\frac{2a^4b^{-1}}{c^2} \right)^{-3}$$

#101 - 108: Perform the given operations for the functions.

$$f(x) = 3x - 5, g(x) = -x^2 + 2x - 7 \text{ and } h(x) = -2x + 1$$

$$101. f(x) + g(x) = \underline{3x - 5} + \underline{-x^2 + 2x - 7}$$

$$= \underline{-x^2 + 5x - 12}$$

$$102. g(x) + h(x)$$

$$103. h(x) - g(x) = \underline{-2x + 1} - \underline{(-x^2 + 2x - 7)}$$

$$= \underline{-2x + 1} + \underline{x^2 - 2x + 7}$$

$$= \underline{x^2 - 4x + 8}$$

$$104. g(x) - f(x)$$

$$105. f(x) \cdot g(x) = \underline{(3x - 5)(-x^2 + 2x - 7)}$$

$$106. f(x) \cdot h(x)$$

$$= \underline{-3x^3 + 6x^2 - 21x + 5x^2 - 10x + 35}$$

$$= \underline{-3x^3 + 11x^2 - 31x + 35}$$

$$107. f(-3) = 3(-3) - 5$$

$$108. g(-5)$$

$$= -9 - 5 = \boxed{-14}$$

EVEN ANSWERS (in order):

4	8	25	17	$\frac{5}{4}$	$-2x^2 + 2x$
$2m^2 - m$	$6x^2 - 5x - 4$	$4x^2 - 20x + 25$	$x = -\frac{13}{5}$	$x = \frac{5}{6}$	$x = -1$
$x = -\frac{26}{7}$	$x = -\frac{7}{2}$	$x = -\frac{29}{50}$	$x = \frac{3}{2}$	$x < 8$	$x \geq 5$
$x \leq -4$	$x < \frac{17}{3}$	$-7 < x < 6$	$x < -2$ or $x \geq 3$	$-\frac{4}{3}$	$y = -6x + 12$
x - int: $(-5, 0)$ y - int: $(0, \frac{10}{3})$	$-\frac{7}{5}$	$2a^2(9a+2)$	$4x^2y^5(6x^2 - 2xy^2 + y^3)$	$(x+7)(x+4)$	$(x-8)(x-3)$
$(x-5)(x+2)$	$(3x+1)(x+2)$	$(4x-3)(x+2)$	$(2x-3)(2x-1)$	$(9y+7)(9y-7)$	$(3x-5)^2$
$x = 6, x = -11$	$x = \frac{3}{2}, x = \frac{2}{3}$	$x = 4 \pm \sqrt{22}$ (exact) or $x = 8.69, -0.69$ (approximate)	A line through $(0, -2)$ and $(4, -5)$	A line through $(4, -3)$ and $(8, -6)$	A line through $(0, -4)$ and $(-3, 0)$
A horizontal line through $(0, -4)$	$7\sqrt{2}$	$2\sqrt{33}$	$15\sqrt{3}$	$40x^2$	$\frac{x^{20}}{y^5}$
y^2z^4	$\frac{b^3c^6}{8a^{12}}$	$-x^2 - 6$	$-x^2 - x - 2$	$-6x^2 + 13x - 5$	-42