Algebra 2 Honors Refresher Packet

Contains refresher problems for the following Algebra 1 skills:

- Order of operations
- Evaluating algebraic expressions
- Properties of real numbers
- Solving 1-and 2- step equations
- Solving equations containing distributive property
- Solving equations with variables on both sides
- Solving absolute value equations
- Solving inequalities
- Graphing a line in slope intercept form
- Graphing a line in standard form using intercepts
- Find the slope given 2 points
- Write the equation of a line given a point and the slope
- Write the equation of a line given 2 points
- Graphing linear inequalities
- Function Notation
- Systems of Equations (graphing, substitution, and elimination)

This packet is highly recommended. All Algebra 2 Honors students will take a test on these skills at the end of the first **full** week of school. The exact date of the test will be given when students return to school.

Table of Contents

Order of Operations

P.E.M.D.A.S.
Parenthesis | Exponents | Multiplication | Division | Addition | Subtraction

1. Perform the operations inside a parenthesis first
2. Then exponents
3. Then multiplication and division, from left to right
4. Then addition and subtraction, from left to right

Simplify $4 + [-1(-2 - 1)]^2$
$= 4 + [-1(-3)]^2$
$= 4 + [3]^2$
$= 4 + 9$
$= 13$

Simplify $4 - 3[4 - 2(6 - 3)] \div 2$
$= 4 - 3[4 - 2(3)] \div 2$
$= 4 - 3[4 - 6] \div 2$
$= 4 - 3[-2] \div 2$
$= 4 + 6 \div 2$
$= 4 + 3$
$= 7$

Simplify $16 - 3(8 - 3)^2 \div 5$
$= 16 - 3(5)^2 \div 5$
$= 16 - 3(25) \div 5$
$= 16 - 75 \div 5$
$= 16 - 15$
$= 1$

Simplify $16 + 2[8 - 3(4 - 2)] + 1$
$= 16 + 2[8 - 3(2)] + 1$
$= 16 + 2[8 - 6] + 1$
$= 16 + 2[2] + 1$
$= 16 + 4 + 1$
$= 20 + 1$
$= 21$

Try these (without a calculator):

1. $[-2 + 4^2 - 10(2)] \div 2$

2. $5[4 + 3(2)] + 10$

3. $10 - (9 - 5)^2 \div (-3)$

4. $100 \div 25 - 8 + 3^3$

5. $(-2 + 10)(4 + 2) \div 12 + 8$

Evaluating Algebraic Expressions

Evaluate $ab^2 - ac$
a = 2, b = –4, and c = ½

$(2)(-4)^2 - (2)(\frac{1}{2})$
$(2)(16) - 1$
$32 - 1$
31

Evaluate $\frac{4xy^2}{-z+10}$

x = 5, y = $\frac{1}{2}$, and z = -15

$$\frac{(4)(5)\left(\frac{1}{2}\right)^2}{-(-15)+10} = \frac{(4)(5)\left(\frac{1}{4}\right)}{15+10} = \frac{5}{25} = \frac{1}{5}$$

Evaluate $|2bc + 4a|$
a = -8, b = 4, and c = 2

$|2(4)(2) + 4(-8)|$

$|16 + -32| = |-16| = 16$

Evaluate $-2|-9xy - z^2|$

x = -3, y = 4, and z = 5

$-2|-9(-3)(4) - (5)^2|$

$-2|108 - 25| = -2|83| = -2(83) = -166$

Try these without a calculator:

6. Evaluate $bc^3 - ad$ for $a = -2$, $b = 3$, $c = -4$, and $d = 4$.

7. Evaluate $|a(b + d)^2 + c|$ for $a = 4$, $b = -7$, $c = 5$, and $d = -1$.

8. Evaluate $\frac{x-y}{y^2+7}$ for x = 15 and y = -1

9. Evaluate ½ $|a + 3b^2|$ + 8 for a = 7 and b = -3

10. Evaluate $5x^4 + 2x^3 - 8x + 8$ for x = -1

Properties of Real Numbers

Commutative Property of Addition: You can add a group of numbers in any order

$1 + 4 + 7 = 7 + 1 + 4$

Commutative Property of Multiplication: You can multiply a group of numbers in any order

$2 \cdot 4 \cdot 6 = 6 \cdot 2 \cdot 4$

Associative Property of Addition: numbers can be added in any order by using grouping symbols

$6 + (9 + 3) = (6 + 9) + 3$

Associative Property of Multiplication: numbers can be multiplied in any order by using grouping symbols

$(4 \cdot 6) \cdot 2 = 4 \cdot (6 \cdot 2)$

Additive Identity: When you add 0 to a number, the answer is always the number

$4 + 0 = 4$

Multiplicative Identity: When you multiply a number by 1, the answer is the number

$7 \times 1 = 7$

Multiplicative Property of Zero: When you multiply a number by 0 the answer is always 0

$9 \times 0 = 0$

Distributive Property: Multiply the outside number by each term on the inside of the parenthesis.

$a\,(b + c) = ab + ac$ $\qquad$ $3(2x - 8) = 6x - 24$

Substitution Property: Replacing an expression with an equal quantity.

$(3 + 7)\,m = 10m$ $\qquad$ If $3^2 + 4g = 12$, then $9 + 4g = 12$

Reflexive Property: Two identical expressions will be equal.

$4 + 5 = 4 + 5$ $\qquad$ $3a = 3a$

Symmetric Property: A statement of equality is also true if written backwards.

If $a = b$, then $b = a$ $\qquad$ If $4x + 2 = 10$, then $10 = 4x + 2$

Transitive Property: (see examples)

If $a = b$, and $b = c$, then $a = c$

If $2x + 1 = 7$, and $7 = 5x - 8$, then $2x + 1 = 5x - 8$

Multiplicative Inverses: Two numbers whose product is 1

$2 \cdot ½ = 1$ $\qquad$ $-\frac{2}{7} \cdot -\frac{7}{2} = 1$

Try these:

Name the property shown by each statement.

11. $1 \cdot 4 = 4$ _____

12. $(-3 + 4) + 5 = -3 + (4 + 5)$ _____

13. $3 \cdot (8 \cdot 0) = (3 \cdot 8) \cdot 0$ _____

14. $2 + 0 = 2$ _____

15. $np = pn$ _____

16. $\frac{1}{3} \cdot 3 = 1$ _____

17. $f + g = g + f$ _____

18. $a + (b + c) = a + (c + b)$ _____

19. If $8 = 2x$, then $2x = 8$ _____

20. $19 \cdot 0 = 0$ _____

21. $4 + 6 \cdot 2 = 4 + 12$ _____

22. $9 = 9$ ` _____

23. If $2 \cdot 3 = 6$, and $6 = 12 \div 2$,

then $2 \cdot 3 = 12 \div 2$ _____

24. $2(x + 6) = 2x + 12$ _____

25. $(x - 7)3 = 3x - 21$ _____

Solving 1- and 2-step equations

x + 4 = -10

- 4 - 4

x = -14

y − 22 = -52

+ 22 + 22

y = -30

-6x = 27

$\frac{-6x}{-6} = \frac{27}{-6}$

$x = -\frac{9}{2}$ or -4.5

$\frac{x}{5} = 8$

$(5)\frac{x}{5} = 8\,(5)$

x = 40

3x + 7 = 73

- 7 -7

3x = 66

x = 22

½ x – 12 = 98

+12 +12

(2) ½ x = 110(2)

x = 220

$\frac{2x}{9} = 10$

$(9)\frac{2x}{9} = 10(9)$

2x = 90

x = 45

2(x + 1) = 12

x + 1 = 6

x = 5

Try these without a calculator:

26. x + 11 = -30

27. x – 21 = 54

28. $\frac{x}{4} = -9$

29. -7x = -56

30. 2x – 9 = 51

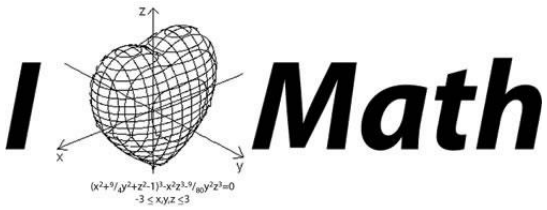
31. $-\frac{x}{7} + 5 = 6$

32. 5(x – 9) = 20

33. -6x + 12 = 85

34. $\frac{2x}{5} = \frac{6}{50}$

35. 5 – 3x = 29



Solving Equations Containing Distributive Property

$2(x + 9) = 13$
$2x + 18 = 13$
$2x = -5$
$x = -\frac{5}{2}$

$10 - 4(x + 8) = 28$
$-10 \qquad -10$
$-4(x + 8) = 18$
$-4x - 32 = 18$
$+32 \quad +32$
$-4x = 50$
$x = -\frac{25}{2}$ or -12.5

Try these without a calculator:

36. $6(2x - 8) = 15$

37. $11 + 4(x + 9) = 0$

38. $2(x - 1) + 3(x + 5) = 7$

39. $32 = 8 - 5(x + 8)$

40. $-9(3x + 10) = 20$

Solving Equations with Variables on Both Sides

$3x + 2 = 4x - 1$
$-4x \quad -4x$
$-x + 2 = -1$
$-2 \quad -2$
$-x = -3$
$x = 3$

$8y - 9 = -3y + 2$
$+3y \quad +3y$
$11y - 9 = 2$
$+9 \quad +9$
$11y = 11$
$y = 1$

$3(x + 4) = 2(x - 1)$
$3x + 12 = 2x - 2$
$-2x \quad -2x$
$x + 12 = -2$
$-12 \quad -12$
$x = -14$

$2x + 5 = 2x - 3$
$-2x \quad -2x$
$5 = -3$

No Solution

Variables cancelled out
Remaining statement is untrue

$3(6x - 10) = 2(9x - 15)$
$18x - 30 = 18x - 30$
$-18x \quad -18x$
$-30 = -30$

Infinitely Many Solutions

Variables cancelled out
Remaining statement is true

Try these:

41. $6x + 7 = 8x - 13$

42. $3 - 4x = 18 + x$

43. $-3 + 12x = 12x - 3$

44. $-8(4 + 9x) = 7(-2 - 11x)$

45. $-8(x + 1) + 3(x - 2) = -3x + 2$

Solving Absolute Value Equations

$| x + 2 | = 7$

$x + 2 = 7$ or $x + 2 = -7$

$x = 5$ $\quad$ $x = -9$

$| 2x – 3 | – 4 = 3$

$| 2x – 3 | = 7$

$2x – 3 = 7$ $\quad$ $2x – 3 = -7$

$2x = 10$ $\quad$ $2x = -4$

$x = 5$ $\quad$ $x = -2$

$3|4x - 2| - 8 = 22$

$3|4x - 2| = 30$

$|4x - 2| = 10$

$4x – 2 = 10$ or $4x – 2 = -10$

$4x = 12$ $\quad$ $4x = -8$

$x = 3$ $\quad$ $x = -2$

$2|x + 7| + 10 = 4$

$2|x + 7| = -6$

$|x + 7| = -3$

No Solution

Absolute value cannot be negative.

Try these:

46. $|3x - 6| = 21$

47. $2|5x + 20| = 80$

48. $–6|2x – 14| = –42$

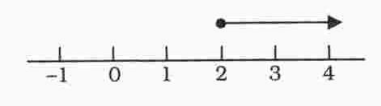
49. $|2x + 9| = 30$

50. $-3|x + 7| = 36$

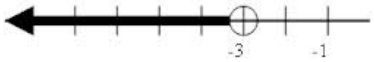
Solving Inequalities

Remember: If you multiply or divide by a negative, you need to turn the inequality around.

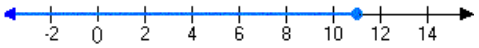
$x + 3 \geq 5$
$-3 \quad -3$
$x \geq 2$



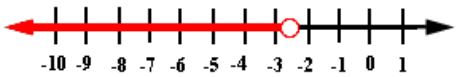
$3x - 7 < -16$
$+7 \quad +7$
$3x < -9$
$x < -3$



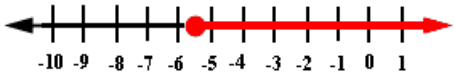
$-5x + 10 \geq -45$
$-10 \quad -10$
$-5x \geq -55$
$x \leq 11$



$3(2x + 10) - 8 < 7$
$6x + 30 - 8 < 7$
$6x + 22 < 7$
$6x < -15$
$x < -2.5$



$3x + 12 \leq 7x + 34$
$-7x \quad -7x$
$-4x + 12 \leq 34$
$-12 \quad -12$
$-4x \leq 22$
$x \geq -5.5$



Try these:

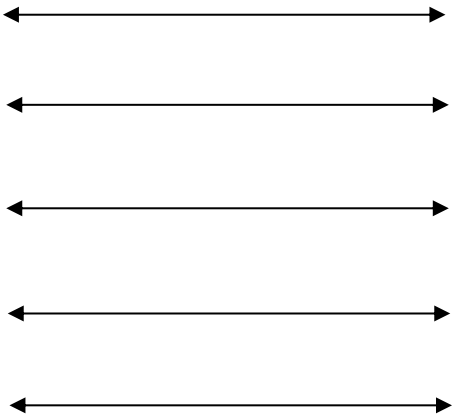
51. $-4 + x \leq 12$

52. $-2x + 10 > 22$

53. $2x + 7 < x - 4$

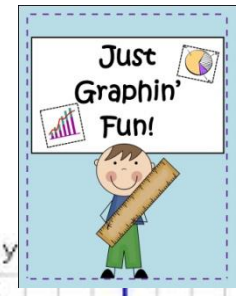
54. $6(x + 5) \leq 15$

55. $4(x - 7) \leq 3(2x - 1) + 3$

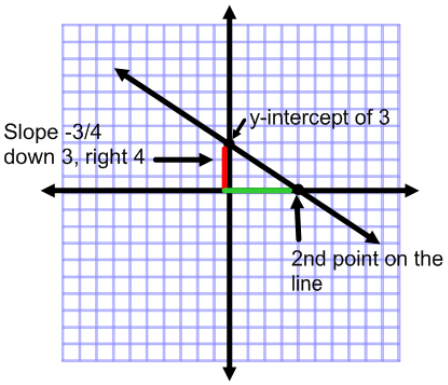


Graphing a Line in Slope Intercept Form

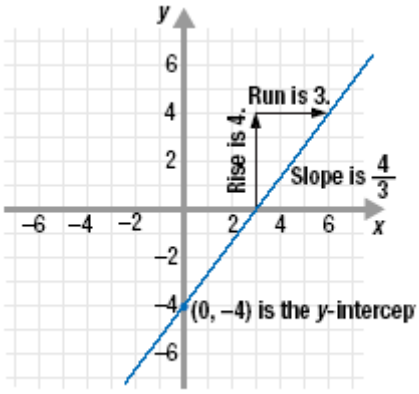
Google Images



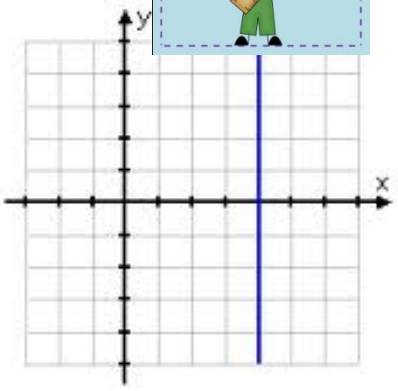
Graph $y = -\frac{3}{4}x + 3$



Graph $y = \frac{4}{3}x - 4$

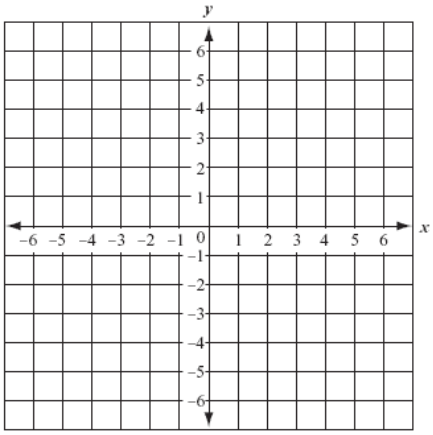


Graph x = 4

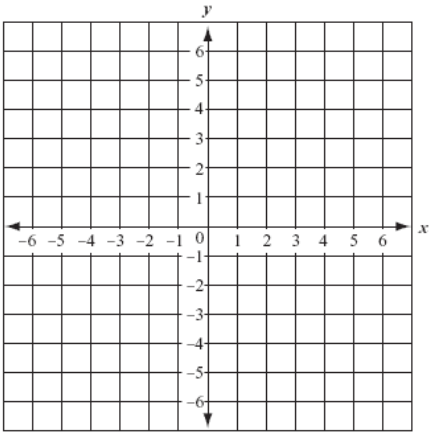


Try these:

56. y = ½ x + 3



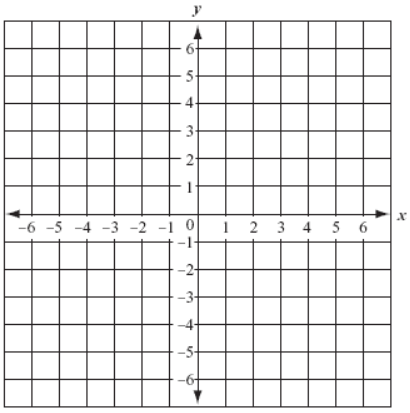
57. y = -3x + 5

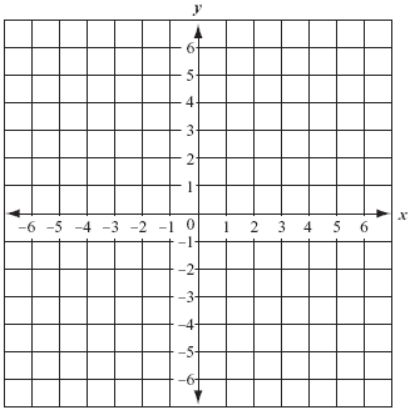


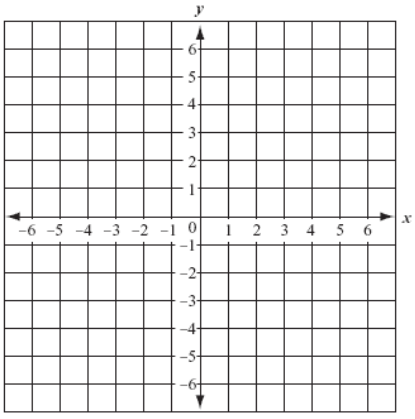
58. $y = -\frac{1}{4}x - 2$

59. y = -1

60. x = 3







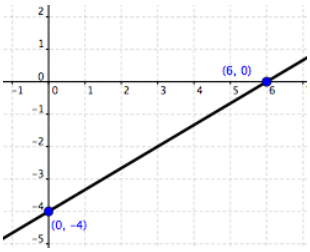
Graphing a Line in Standard Form Using Intercepts

Google images

-2x + 3y = -12

x-int: -2x + 3(0) = -12
-2x = -12
x = 6

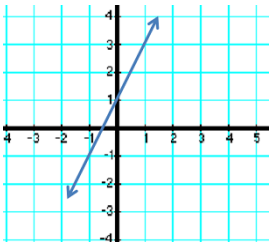
y –int: -2(0) + 3y = -12
3y = -12
y = -4



-2x + y – 1 = 0
-2x + y = 1

x-int: -2x + 0 = 1
-2x = 1
$x = -\frac{1}{2}$

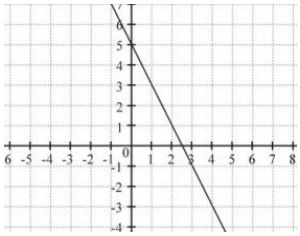
y-int: -2(0) + y = 1
y = 1



4x + 2y = 10

x-int: 4x + 2(0) = 10
4x = 10
x = 2.5

y-int: 4(0) + 2y = 10
2y = 10
y = 5



Try these:

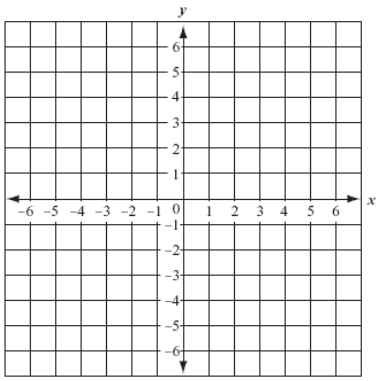
61. 3x – 4y = -12

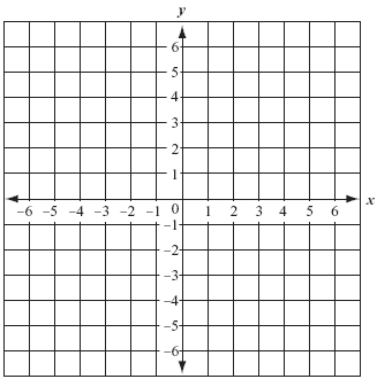
62. –5x + 3y = -15

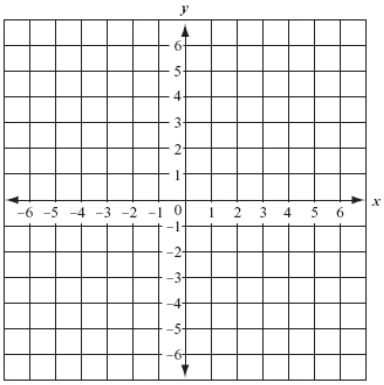
63. 4x – 8y = 12

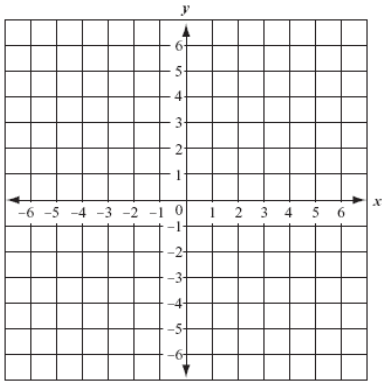
64. $\frac{1}{2}x - 2y = 3$

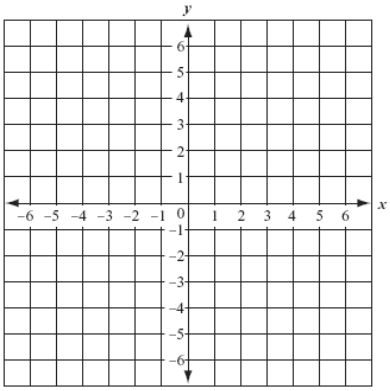
65. 6x – 4y + 10 = 2











Find the Slope Given 2 Points

Given two points:

(x_1, y_1) (x_2, y_2)

Slope Formula:

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

(-3, 6) (15, -6)

$$\frac{-6-6}{15--3}$$

$$\frac{-12}{18}$$

$$-\frac{2}{3}$$

(5, -8) (5, 10)

$$= \frac{10--8}{5-5}$$

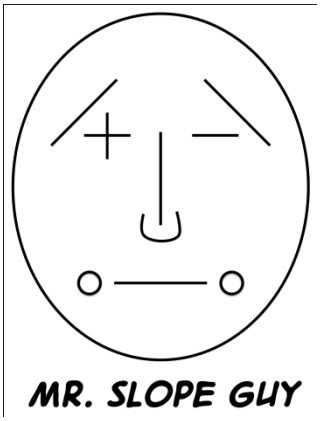
$$= \frac{18}{0}$$

Undefined: These points create a vertical line.

(2, -4)(8, -4)

$$= \frac{-4--4}{8-2}$$

$$= \frac{0}{6} = 0$$



Try these: Reduce all answers if possible.

66. (-5, -7) (10, 4)

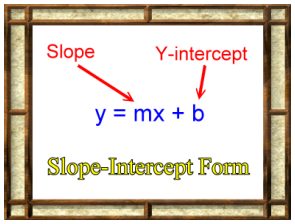
67. (4, 10) (6, 10)

68. (-4, 12) (8, 11)

69. (1, 0) (7, -2)

70. (-14, 6) (-14, 9)

Write the equation of a Line Given a Point and the Slope



slope = 2	slope = $-\frac{2}{3}$	slope = 0
point(-4, 7)	point (5, -3)	point(8, -13)
y = mx + b	y = mx + b	y = mx + b
7 = 2(-4) + b	-3 = $-\frac{2}{3}$ (5) + b	-13 = 0(8) + b
7 = -8 + b	-3 = $-\frac{10}{3}$ + b	-13 = 0 + b
15 = b	b = $\frac{1}{3}$	-13 = b
y = 2x + 15	**y = $-\frac{2}{3}$x + $\frac{1}{3}$**	**y = -13**
		(do not write 0x for slope)

Try these:

71. slope = -2
    point (5, 8)

72. slope = $\frac{1}{5}$
    point (10, -7)

73. slope = 8
    point (-9, 0)

74. slope = $\frac{3}{4}$
    point (-6, 3)

75. slope = 0
    point (15, -12)

Write the Equation of a Line Given 2 Points

(-2, 5)(3, 1)	(2, 5)(-10, 2)	(4, -2)(4, 6)
Find Slope: $\frac{1-5}{3--2} = -\frac{4}{5}$	$\frac{2-5}{-10-2} = \frac{3}{12} = \frac{1}{4}$	$\frac{6--2}{4-4} = \frac{8}{0}$ undefined
Find y-int: y = mx + b	y = mx + b	so, the equation will be
$1 = -\frac{4}{5}(3) + b$	$5 = \frac{1}{4}(2) + b$	**x = 4**
$1 = -\frac{12}{5} + b$	5 = ½ + b	Since the slope is undefined,
$\frac{17}{5} = b$	4.5 = b	the line is vertical and passes
Equation: $\mathbf{y = -\frac{4}{5}x + \frac{17}{5}}$	$\mathbf{y = \frac{1}{4}x + 4.5}$	through x = 4 only.

Try these:

76. (1, 4)(-2, 5)

77. (0, -4)(6, 8)

78. (3, -2)(9, -2)

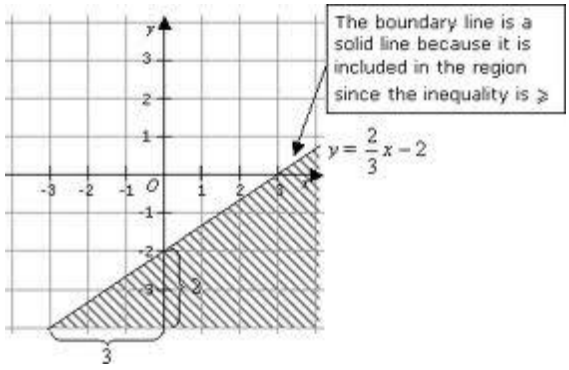
79. (8, 10)(-4, 8)

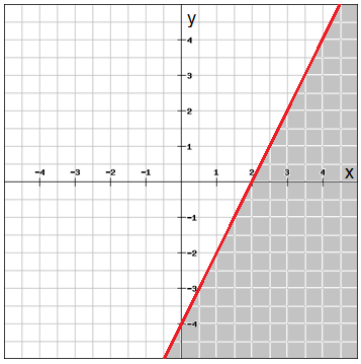
80. (10, 6)(10, -8)

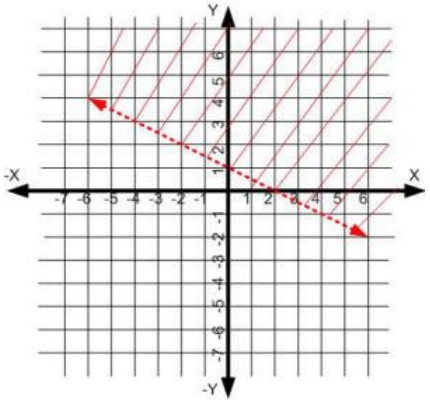
Graphing Linear Inequalities

Google images

$y \leq \frac{2}{3}x - 2$ $y \leq 2x - 4$ $y > -\frac{1}{2}x + 1$







Try these:

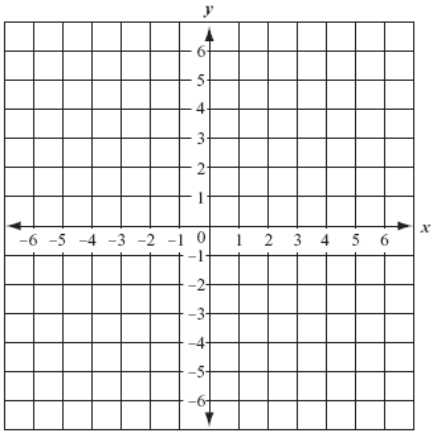
81. $y < \frac{1}{2}x - 4$

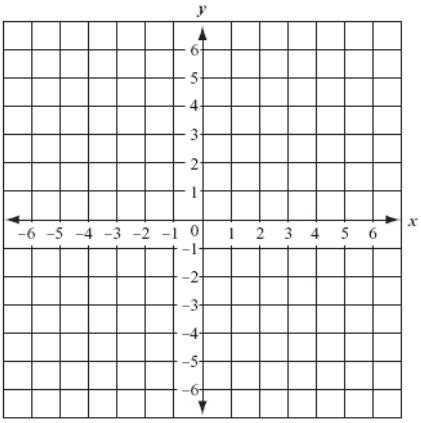
82. $y \geq -x + 2$

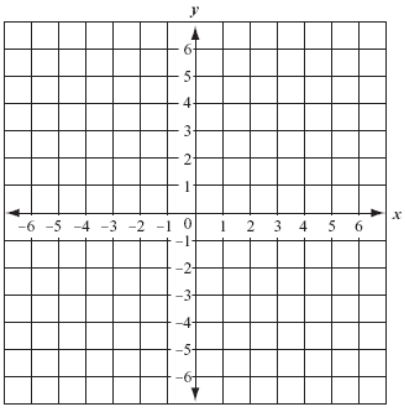
83. $y \leq 3$

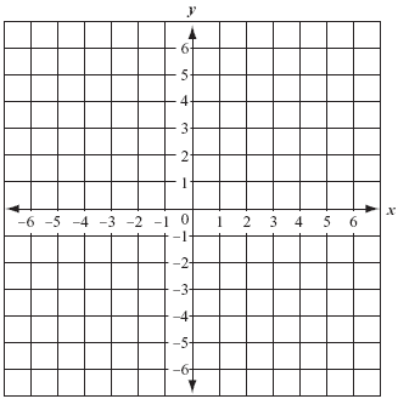
84. $y > 4x$

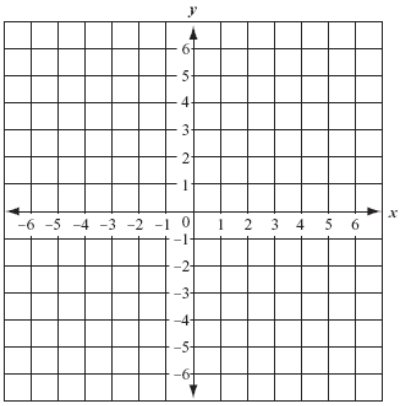
85. $y + 5 < \frac{2}{3}x$





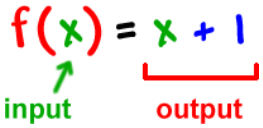






Function Notation

If you use x to represent your domain values, here's an example of function notation:



(You read f(x), as "f of x".)

So f(3) would look like this: $f(3) = 3 + 1 = 4$

$f(3) = 4$

What if we have f(-5)? $f(-5) = -5 + 1 = -4$

$f(-5) = -4$

Interpreting the final answer:

- f is not a variable. You do not solve for it.
- f(-5) is simply an "announcement" that in function f you have plugged in a -5.
- -4 is the solution.

Try these:

86. If $f(x) = -5x + 9$, then find f(3).

87. If $f(x) = \frac{1}{2}x - 17$, then find f(-10).

88. If $f(x) = x^2 + 19$, then find f(2).

89. If $f(x) = 4x^2 + 2x - 1$, then find f(6).

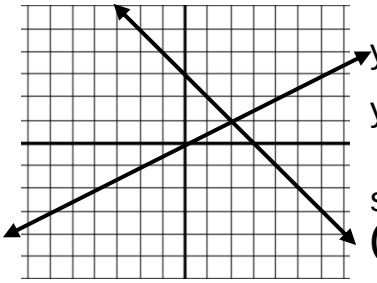
90. If $f(x) = -x^2 - 6x$, then find f(-9).

Solving a system using graphing

y = -x + 3

y = ½ x

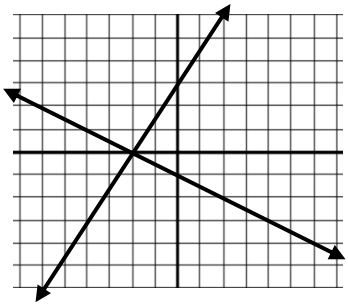
solution:
(2, 1)



$y = -\frac{1}{2}x - 1$

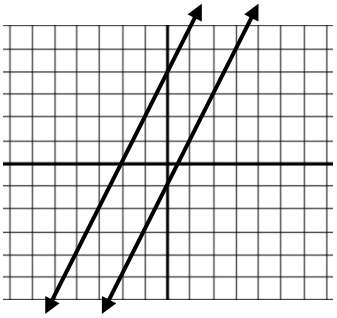
$y = \frac{3}{2}x + 3$

solution:
(-2, 0)



y = 2x + 4
y = 2x – 1

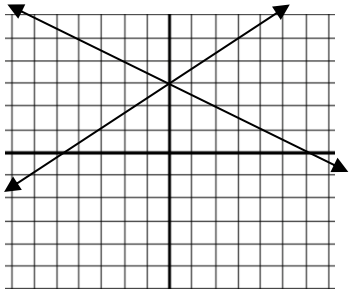
Parallel lines have <u>no solution</u>.



2x + 4y = 12
-2x + 3y = 9

Put in slope-intercept form:

2x + 4y = 12	-2x + 3y = 9
4y = -2x + 12	3y = 2x + 9
y = - ½ x + 3	$y = \frac{2}{3}x + 3$



(0, 3)

Try these:

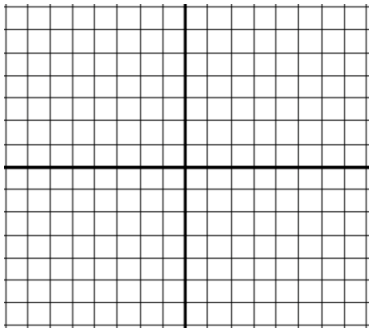
91. y = 4x + 2
    y = -x – 2

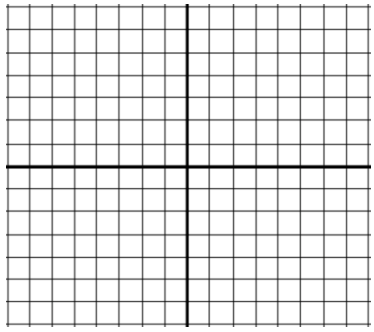
92. $y = -\frac{5}{3}x + 3$
    $y = \frac{1}{3}x - 3$

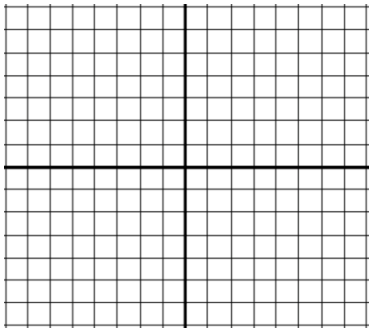
93. y = 3x – 4
    $y = -\frac{1}{2}x + 3$

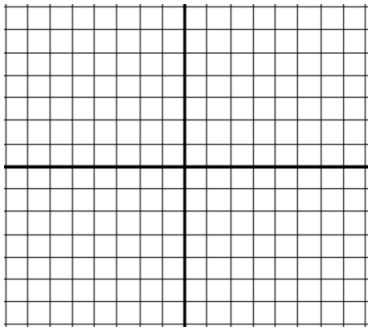
94. y = 3x + 7
    y = 3x + 1

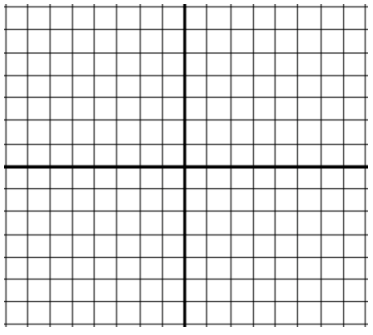
95. x + 2y = -4
    3x + 2y = 4





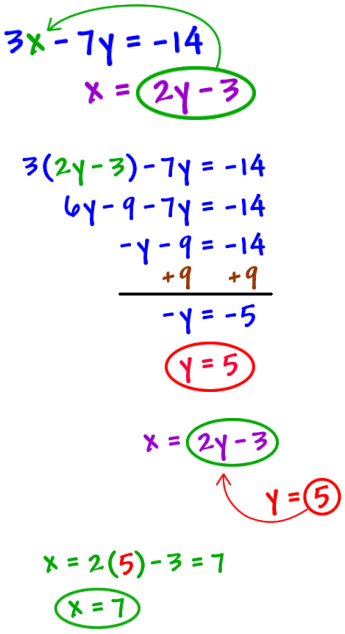






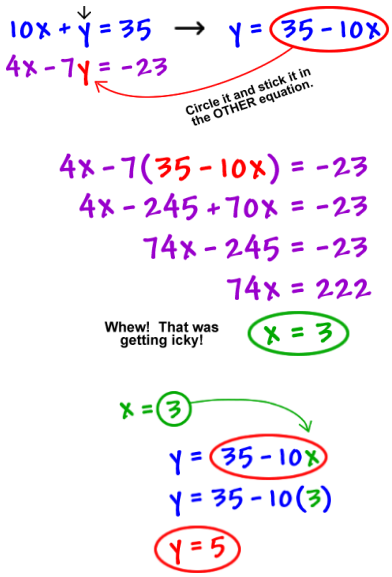
Solving systems using substitution

3x – 7y = -14
x = 2y – 3



Solution: (7, 5)

10x + y = 35
4x - 7y = -23



Solution: (3, 5)

2x + 4y = -6
x + 2y = 3

x = -2y + 3

2(-2y + 3) + 4y = -6
-4y + 6 + 4y = -6
6 = -6

No solution

Try these.

96. y = 6x – 11
-2x – 3y = -7

97. y = -5x – 17
-3x – 3y = 3

98. -4x + y = 6
-5x – y = 21

99. -3x + 3y = 4
-x + y = 3

100. -2x – y = -9
5x – 2y = 18

Solving systems using elimination

$2x + 3y = 20$
$-2x + y = 4$

$2x + 3y = 20$
$+\ -2x + y = 4$
$0 + 4y = 24$
$4y = 24$
$y = 6$

$y = 6$
$-2x + y = 4$
$-2x + 6 = 4$
$-2x = -2$
$x = 1$

Solution: (1, 6)

$3x - 4y = -5$
$5x - 2y = -6$

$3x - 4y = -5$
$-2(5x - 2y = -6)$

$3x - 4y = -5$
$-10x + 4y = 12$
$-7x + 0 = 7$
$-7x = 7$
$x = -1$

$3(-1) - 4y = -5$

$-4y = -2$
$y = ½$

Solution : (-1, ½)

$2x + 8y = 6$
$-5x - 20y = -15$

$5(2x + 8y = 6)$
$2(-5x - 20y = -15)$

$10x + 40y = 30$
$-10y - 40y = -30$

$0 = 0$

Infinitely Many Solutions

$-3 - 4y = -5$

Try these:

101. $-4x - 2y = -12$
$4x + 8y = -24$

102. $x - y = 11$
$2x + y = 19$

103. $8x + y = -16$
$-3x + y = -5$

104. $-7x + y = -19$
$-2x + 3y = -19$

105. $3x - 2y = 2$
$12x - 8y = 8$