

Montini Catholic High School
Algebra I Concepts

All students enrolled in Plane Geometry (math 322) for the fall of 2022 will take a diagnostic exam the first week of school to assess their retention of basic Algebra I concepts that are necessary to be successful in future math courses. When the student is given the results, they will also be given remediation work for any concepts the student struggled with, upon completion their grade on the diagnostic will be adjusted. This packet covers the same concepts that are on the diagnostic exam. If done properly, this will hopefully alleviate the need for any remediation in the fall. (Problems that are crossed off are only done for students entering math 324 or 326)

As you go through each topic, check your answer. If you are having difficulty, we have included different avenues for help:

- MCHS videos in the schoology group *2022 Summer Mathematics* 99WH-VP8Q-9RRH7
Transfer students, DO NOT use your montini email address to set up your Schoology account. Please use a personal email.
- Videos, examples, and practice problems via [khanacademy.org](https://www.khanacademy.org) (a free website)
- Any search engine on the internet
- Local library

Concepts covered:

- A.
 - Operations with negative numbers
 - Operations with fractions
 - Simplify numerical expression (including negatives and fractions)
- B.
 - Absolute value
 - Simplify radicals
- C.
 - Simplify algebraic expression (order of operations, like terms, laws exponents...)
 - Evaluate an algebraic expression
- D.
 - Solve linear equations of one variable
 - Solve systems of linear equations
- E.
 - Factor expressions of one variable
- F.
 - Find x-intercepts and y-intercepts
 - Graph linear equations
- G.
 - Translating verbal statements into mathematical statements
- H.
 - ~~Quadratics: graphs (including finding the vertex and intercepts)~~
 - Solve quadratics

ALL QUESTIONS ARE INTENDED TO BE COMPLETED
WITHOUT A CALCULATOR

SHOW WORK

All fractions should be simplified and expressed in improper
form: $\frac{a}{b}$

Answers are at the end of the packet

A. operations with negatives & fractions / simplify numerical expressions

Evaluate (Write the value of each expression)

1. $36 - 21 - 13 =$	2. $-4 - 11 =$	3. $(-12)(4) =$
4. $(12)\left(\frac{1}{4}\right) =$	5. $\frac{-18}{-3} =$	6. $\left(\frac{4}{5}\right)\left(\frac{30}{8}\right) =$
7. $\left(\frac{27}{5}\right) \div \left(\frac{3}{35}\right) =$	8. $\frac{3}{4} - \frac{1}{2} =$	9. $2\frac{3}{4} + 1\frac{1}{2} =$
10. $2(3+1)^2 - 4 \cdot 3 =$	11. $\frac{3+2 \cdot 6 - 5}{3^2 - 7} =$	12. $6\frac{1}{3} - 4\frac{2}{3} =$

For help go to: MCHS schoology group *2022 Summer Mathematics* for supplemental videos OR

Khanacademy.org:

- Pre-algebra
 - Negative numbers
 - Adding and subtracting negative numbers
 - Multiplying and dividing negative numbers



<https://www.khanacademy.org/math/arithmetic/arith-review-negative-numbers/arith-review-sub-neg-intro/v/adding-and-subtracting-negative-number-examples>

<https://www.khanacademy.org/math/arithmetic/arith-review-negative-numbers/arith-review-add-and-sub-integers/v/adding-integers-with-different-signs>

<https://www.khanacademy.org/math/arithmetic-home/negative-numbers/mult-divide-negatives/v/multiplying-negative-real-numbers>

- Fractions
 - Adding and subtracting fractions with unlike denominators
 - Adding and subtracting mixed numbers
 - Multiplying fractions

<https://www.khanacademy.org/math/arithmetic/fraction-arithmetic>

<https://www.khanacademy.org/math/algebra-basics/basic-alg-foundations/alg-basics-fractions/v/multiplying-negative-and-positive-fractions>

<https://www.khanacademy.org/math/arithmetric/fraction-arithmetric/arith-review-dividing-fractions/v/conceptual-understanding-of-dividing-fractions-by-fractions>

<https://www.khanacademy.org/math/arithmetric/fraction-arithmetric/arith-review-dividing-fractions/v/dividing-fractions-example>

<https://www.khanacademy.org/math/cc-fifth-grade-math/imp-fractions-3/imp-adding-and-subtracting-fractions-with-unlike-denominators/v/adding-fractions-with-unlike-denominators-introduction>

<https://www.khanacademy.org/math/arithmetric/fraction-arithmetric/arith-review-add-sub-fractions/v/adding-small-fractions-with-unlike-denominators>

<https://www.khanacademy.org/math/arithmetric/fraction-arithmetric/arith-review-add-sub-fractions/v/subtracting-small-fractions-with-unlike-denominators>

B. Absolute Value and Radicals

Simplify each of the following

13. $ 4 - 6 =$	14. $2 -5 =$	15. $3 2 + 2 -4 =$
16. $-2 3 - 4 + 5 -1 - 6 =$	17. $\frac{2 3(-7 + 5) }{ 1 - 6 } =$	18. $\sqrt{144} =$
19. $\sqrt{72} =$	20. $\sqrt{50} + \sqrt{8} =$	21. $\sqrt{6^2 + 8^2} =$
22. $(4\sqrt{3})(5\sqrt{2}) =$	23. $\frac{1}{2\sqrt{3}} =$	24. $\sqrt{\frac{25}{8}} =$

For help go to: MCHS schoology group 2022 Summer Mathematics for supplemental videos OR

OR Khanacademy.org:

- Absolute value (example video & practice)
- Simplifying square roots (algebra video & practice)
- Rationalizing the denominator (algebra video, worked example video, & practice)



C. Simplify & Evaluate Algebraic Expressions

Simplify #25-30 Evaluate #31-39

25. $2(x+2y)-3x+y=$	26. $x(x+2y)+3x^2-4y=$	27. $(x+3)^2+x^2-4x+2=$
28. $(3x+5)(3x-5)=$	29. a. $x^2x^3=$ b. $2(y^2)^3=$	30. $\frac{3y^3}{15y}=$
31. if $a=3$ & $b=2$, then $5a-4b=$	32. if $m=-2$ & $p=2$, then $4m-2p=$	33. if $d=3$ & $b=2$, then $\frac{3b}{4}+\frac{d}{2}=$
34. if $a=-3$ & $b=2$, then $a^2-4b=$	35. if $a=\frac{1}{2}$ & $c=-2$, then $6a-4b=$	36. if $k=-1$ & $g=-2$, then $3(k+2)+4g=$
37. if $a=2$ & $b=3$, then $(a+1)^2-4b=$	38. if $x=2$ & $y=6$, then $\frac{3x+2y}{x-3y}=$	39. if $m=\frac{2}{3}$ & $b=\frac{3}{4}$, then $9m+3(2b-1)=$

For help go to: MCHS schoology group 2022 Summer Mathematics for supplemental videos

OR khanacademy.org:

- Simplifying expressions
- Combining like terms
- exponent rules, exponent properties
- evaluating an expression



D. Solve linear equations of one variable & Solve linear system of equations

Solve each equation or system of equations

40. $2x + 3 = 5$	41. $3a - 5 = 4$	42. $3(d + 1) - 4d = 2$
43. $3b - 2 = 4b + 1$	44. $3(c - 2) = 2c + 4$	45. $2(4 - 3r) = 6(r + 2)$
46. $\frac{b-1}{2} = \frac{2b+3}{4}$	47. $2x - 3(x+1) = 4x - 2$	48. $2(y - 3) = \frac{1}{2}(2y + 8)$
49. $x - 3 = 5$	50. $2 3 - x = 4$	51. $3 2a - 1 = 4$

52. $\frac{ k-3 }{5} = \frac{3}{2}$	53. $\frac{2x+1}{3} = \frac{x-1}{4}$	54. $\frac{3x-2}{4} = \frac{1}{2}x$
55. $\begin{cases} x+y=4 \\ 2x-y=5 \end{cases}$	56. $\begin{cases} 2x+y=-1 \\ 5x=10 \end{cases}$	57. $\begin{cases} 2x-3y=-5 \\ 3x+y=9 \end{cases}$

<p>58. $\begin{cases} 5x = 2y + 4 \\ 7x + 3y = -6 \end{cases}$</p>	<p>59. $\begin{cases} 12x - 6y = -4 \\ 9x + 2y = 10 \end{cases}$</p>	<p>60. $\begin{cases} 15x + 4y = 3 \\ 9x - 6y = 6 \end{cases}$</p>
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For help with #40-54 go to: MCHS schoology group *2022 Summer Mathematics* for supplemental videos
OR

khanacademy.org:

- Linear equations 1, 2, 3, 4
- Solve absolute value equations
- Absolute value equations with one solution
- Absolute value equation with two solutions



For help with #55-60 go to: MCHS schoology group *2022 Summer Mathematics* for supplemental videos
OR

Khanacademy.org:

- System of linear equations
- Solving system of equations by elimination
- Solving linear systems by substitution
- Systems of equations by substitution (practice)



E. Factor expressions of one variable

Factor

61. $6x^2y - 4xy^3$	62. $12a^2b^2 + 30ab^3 - 24a^2b$	63. $x^2 + 7x + 12$
64. $m^2 - 11m + 18$	65. $y^2 - 3y - 10$	66. $2b^2 - 5b - 3$
67. $4x^2 + 13x - 12$	68. $6d^2 - 25d + 4$	69. $6p^2 - 8p - 8$
70. $9v^2 - 12v + 4$	71. $x^2 - 36$	72. $81y^2 - 16$

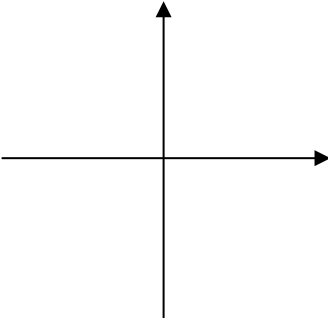
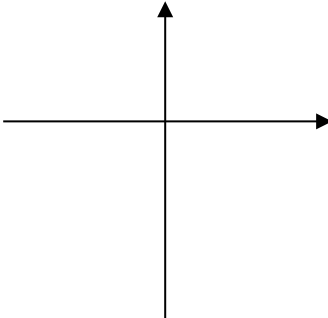
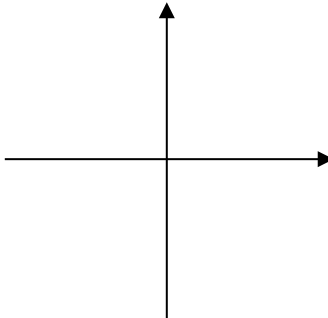
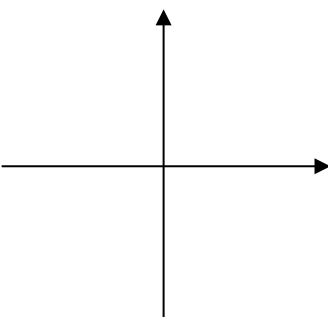
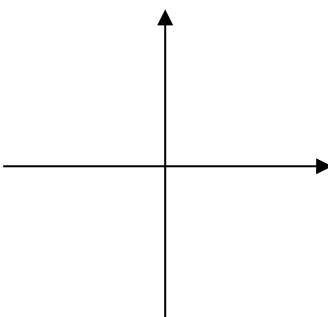
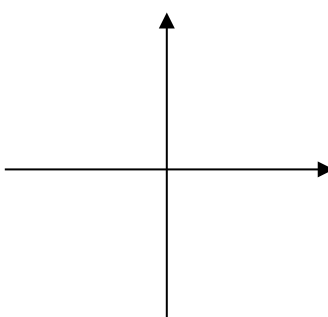
For help go to: MCHS schoology group *2022 Summer Mathematics* for supplemental videos OR Khanacademy.org:

- Greatest common factor (video and practice)
- Factor polynomials: common factor
- Factor quadratics intro
- Factoring quadratics as
- Factoring quadratics: leading coefficient $\neq 1$
- Factor quadratics by grouping
- Factoring quadratics: common factor + grouping
- More examples of factoring quadratics



F. Find intercepts, linear graphs

Write the intercepts of each equation and then sketch the graph

<p>73. $y = 2x + 3$</p> <p>x-int: y-int:</p> 	<p>74. $2x + 3y = 6$</p> <p>x-int: y-int:</p> 	<p>75. $3x - 4y = 24$</p> <p>x-int: y-int:</p> 
<p>76. $5x - 3y = 10$</p> <p>x-int: y-int:</p> 	<p>77. $4x + 3y = -15$</p> <p>x-int: y-int:</p> 	<p>78. $\frac{1}{2}x - y = -2$</p> <p>x-int: y-int:</p> 

For help go to: MCHS schoology group 2022 Summer Mathematics for supplemental videos OR

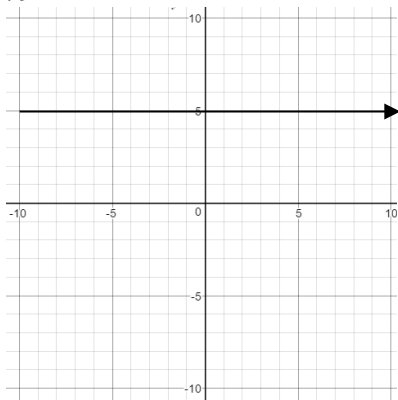
Khanacademy.org:

- Intro to intercepts
- Intercepts from an equation
- x-intercept of a line
- intercepts of lines review
- graphing lines
- graph from linear standard form
- graphing a linear equation



For each of the following graphs write the intercepts, slope, and the equation (in the form $y - y_1 = m(x - x_1)$)

79.



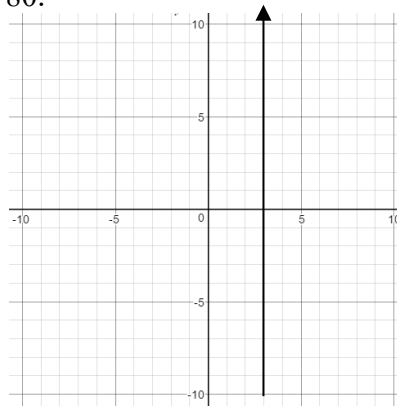
x-int:

y-int:

slope:

equation:

80.



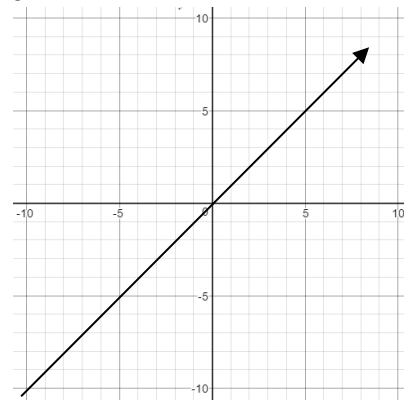
x-int:

y-int:

slope:

equation:

81.



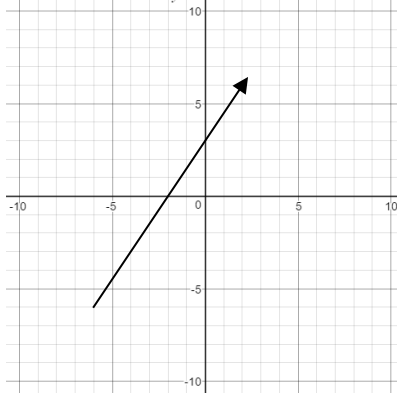
x-int:

y-int:

slope:

equation:

82.



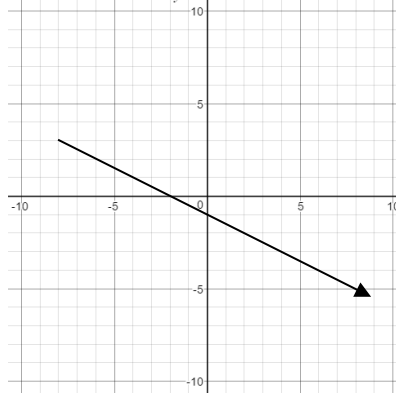
x-int:

y-int:

Slope:

equation:

83.



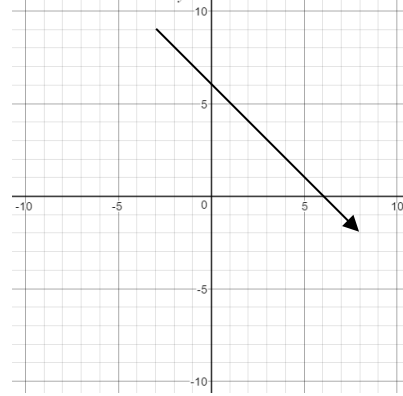
x-int:

y-int:

Slope:

equation:

84.



x-int:

y-int:

Slope:

equation:

For help go to: [MCHS schoology group 2022 Summer Mathematics](https://www.khanacademy.org) for supplemental videos OR [Khanacademy.org](https://www.khanacademy.org)

- Intercepts from a graph
- Slope-intercept equation from graph
- Convert linear equations to standard form
- Linear equations in any form



G. Translating verbal statements into mathematical statements

85. 3 less than a number n	86. the sum of 5 and y	87. 4 more than twice a number n
88. 6 less than the sum of b and 1	89. 8 more than the product of 2 and x	90. a number q decreased by 10

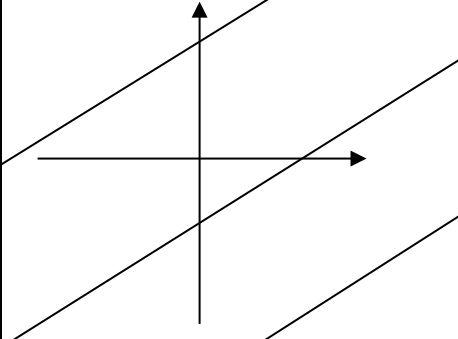
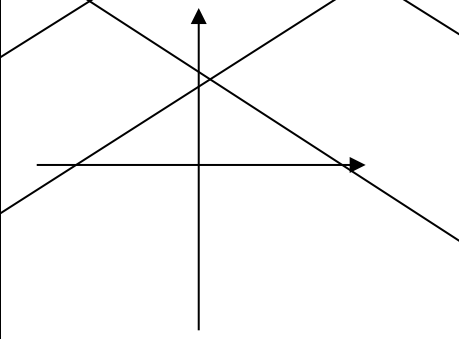
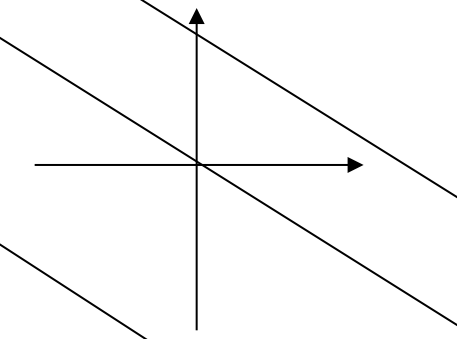
91. a number m is more than 17	92. 3 times a number r is greater than 5	93. quotient of 10 and b
94. the difference of twice x and 7	95. 6 is increased by the product of 4 and n	96. the product of 8 and the sum of 12 and y

For help, go to: [MCHS schoology group 2022 Summer Mathematics](https://www.khanacademy.org) for supplemental videos OR [khanacademy.org](https://www.khanacademy.org):

- writing expressions with variables

H. Quadratics (vertex, intercepts, graph) solve
Graph each quadratic, list the vertex and intercepts

97. $y = (x+1)^2 - 4$	98. $y = (x-3)^2 + 5$	99. $y = 2x^2 - x - 3$
Vertex: x-intercept(s): y-intercept:	Vertex: x-intercept(s): y-intercept:	Vertex: x-intercept(s): y-intercept:

100. $y = 3x^2 - 4x - 4$	101. $y = (x - 5)(x + 3)$	102. $y = 2(x - 1)(x - 6)$
Vertex: x-intercept(s): y-intercept:	Vertex: x-intercept(s): y-intercept:	Vertex: x-intercept(s): y-intercept:
		

Solve

103. $x^2 - 49 = 0$	104. $3x^2 - 48 = 0$	105. $x^2 - 4x = 0$
106. $3x^2 + 18 = 0$	107. $x^2 - 13x + 40 = 0$	108. $x^2 - 3x - 10 = 0$
109. $4x^2 + 12x + 9 = 0$	110. $6x^2 + 16x + 8 = 0$	111. $9x^2 - 50x - 24 = 0$

For help with #97-102, go to: MCHS schoology group 2022 Summer Mathematics for supplemental videos
OR

Khanacademy.org:

- Vertex and axis of symmetry of a parabola
- Graphing quadratics: vertex form
- Graph quadratics: vertex form



- Graphing quadratics: standard form
- Graph quadratics: standard form
- Graphing quadratics in factored form
- Graph quadratics: factored form
- Graph quadratics all forms
- Forms & features of quadratic functions

For help with #103-111, go to: MCHS schoology group 2022 Summer Mathematics for supplemental videos
OR

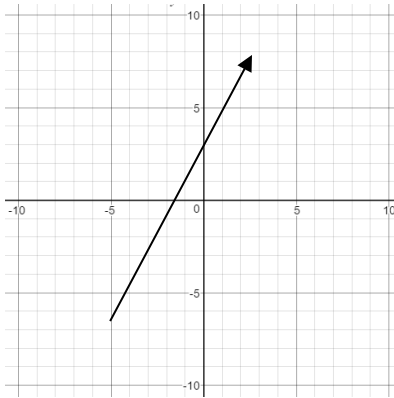
Khanacademy.org

- Solving quadratics by factoring
- Using the quadratic formula

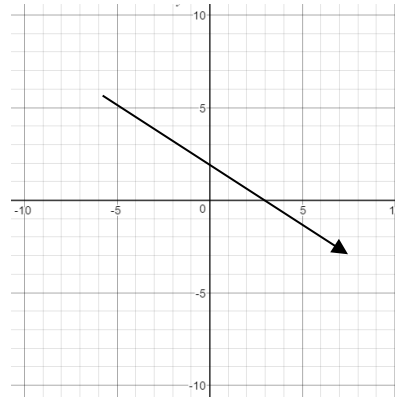
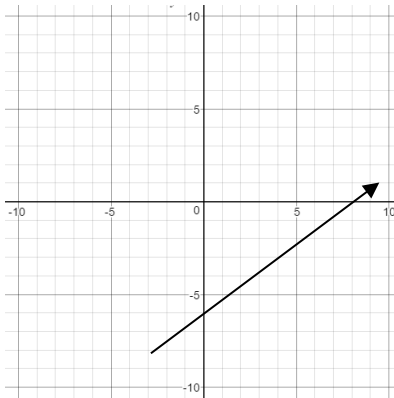


ANSWERS:

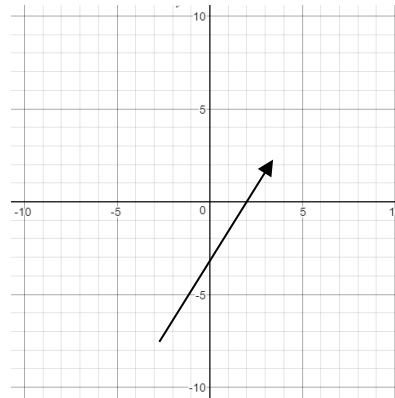
- | | | | | |
|------------------------------------------------------|-------------------------------------------------|-----------------------------|-----------------------------------|----------------------------------------------|
| 1. 2 | 2. -15 | 3. -48 | 4. 3 | 5. 6 |
| 6. 3 | 7. 63 | 8. $\frac{1}{4}$ | 9. $\frac{17}{4}$ | 10. 20 |
| 11. 5 | 12. $\frac{5}{3}$ | 13. 2 | 14. 10 | 15. 14 |
| 16. 33 | 17. $\frac{12}{5}$ | 18. 12 | 19. $6\sqrt{2}$ | 20. $7\sqrt{2}$ |
| 21. 10 | 22. $20\sqrt{6}$ | 23. $\frac{\sqrt{3}}{6}$ | 24. $\frac{5\sqrt{2}}{4}$ | 25. $-x+5y$ |
| 26. $4x^2+2xy-4y$ | 27. $2x^2+2x+11$ | 28. $9x^2-25$ | 29. a. x^5 b. $2y^6$ | 30. $\frac{y^2}{5}$ |
| 31. 7 | 32. -12 | 33. 3 | 34. 1 | 35. 11 |
| 36. -5 | 37. -3 | 38. $-\frac{9}{8}$ | 39. $\frac{15}{2}$ | 40. 1 |
| 41. 3 | 42. 1 | 43. -3 | 44. 10 | 45. $-\frac{1}{3}$ |
| 46. no solution | 47. $-\frac{1}{5}$ | 48. 10 | 49. $\{-2,8\}$ | 50. $\{1,5\}$ |
| 51. $\left\{-\frac{1}{6}, \frac{7}{6}\right\}$ | 52. $\left\{-\frac{9}{2}, \frac{21}{2}\right\}$ | 53. $-\frac{7}{5}$ | 54. 2 | 55. (3,1) |
| 56. (2,-5) | 57. (2,3) | 58. (0,-2) | 59. $\left(\frac{2}{3}, 2\right)$ | 60. $\left(\frac{1}{3}, -\frac{1}{2}\right)$ |
| 61. $2xy(3x-2y^2)$ | 62. $6ab(2ab+5b^2-4a)$ | 63. $(x+4)(x+3)$ | | |
| 64. $(m-9)(m-2)$ | 65. $(y-5)(y+2)$ | 66. $(2b+1)(b-3)$ | | |
| 67. $(4x-3)(x+4)$ | 68. $(6d-1)(d-4)$ | 69. $2(3p+2)(p-2)$ | | |
| 70. $(3v-2)^2$ | 71. $(x+6)(x-6)$ | 72. $(9y+4)(9y-4)$ | | |
| 73. x-int $\left(-\frac{3}{2}, 0\right)$ y-int (0,3) | | 74. x-int (3,0) y-int (0,2) | | |



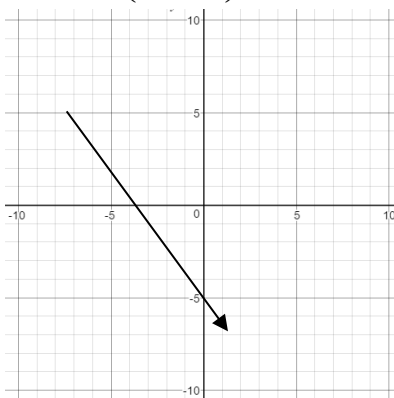
75. x-int $(8,0)$ y-int $(0,-6)$



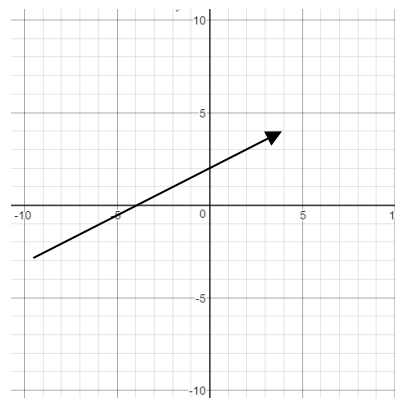
76. x-int $(2,0)$ y-int $(0,-\frac{10}{3})$



77. x-int $(-\frac{15}{4},0)$ y-int $(0,-5)$



78. x-int $(-4,0)$ y-int $(0,2)$



79. x-int *none* y-int $(0,5)$ equation: $y = 5$

80. x-int $(3,0)$ y-int *none* equation: $x = 3$

81. x-int $(0,0)$ y-int $(0,0)$ equation: $y = x$

82. x-int $(-2,0)$ y-int $(0,3)$ equation:

83. x-int $(-2,0)$ y-int $(0,-1)$ equation:

84. x-int $(6,0)$ y-int $(0,6)$ equation:

85. $n - 3$

86. $5 + y$

87. $2n + 4$

88. $(b + 1) - 6$

89. $2x + 8$

90. $q - 10$

91. $m > 17$

92. $3r > 5$

93. $\frac{10}{b}$

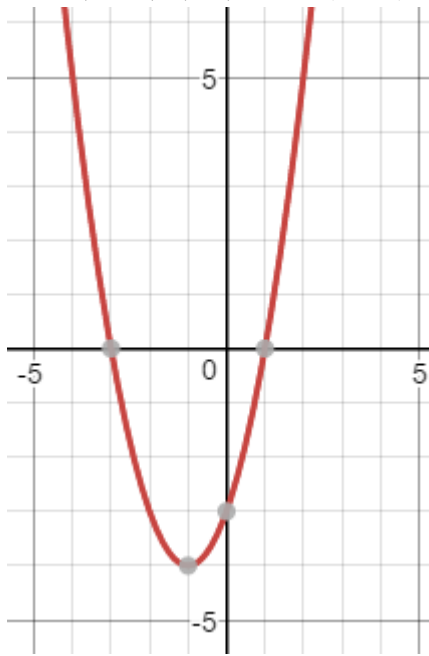
94. $2x - 7$

95. $6 + 4n$

96. $8(12 + y)$

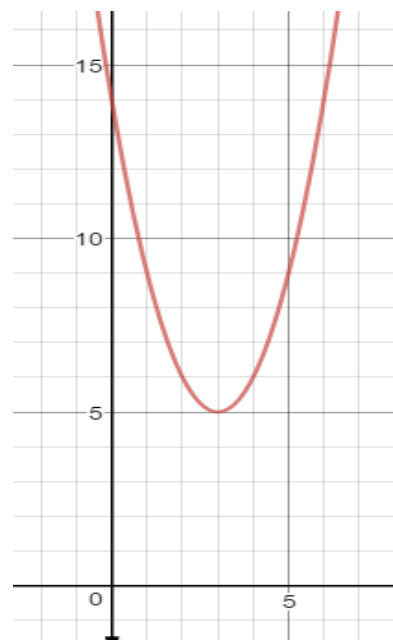
97. vertex: $(-1, -4)$

x-int: $(-4, 0), (1, 0)$ y-int: $(0, -3)$



98. vertex: $(3, 5)$

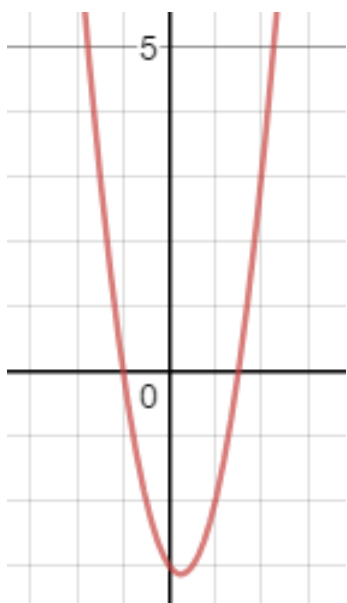
x-int: *none* y-int: $(0, 14)$



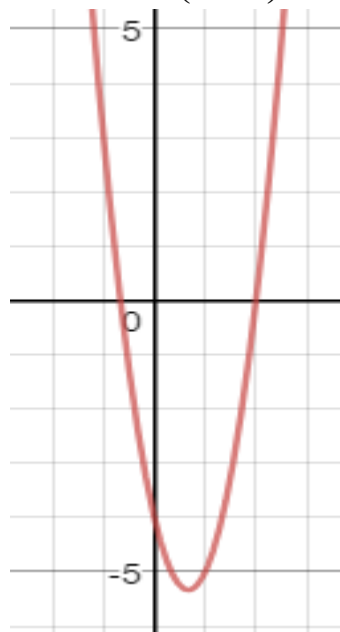
99. vertex: $\left(\frac{1}{4}, -\frac{25}{8}\right)$

100. vertex: $\left(\frac{2}{3}, -\frac{16}{3}\right)$

x-int: $(-1,0), (\frac{3}{2},0)$ y-int: $(0,-3)$

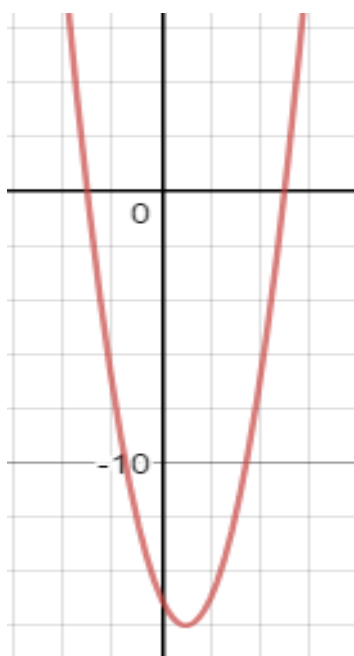


x-int: $(-\frac{2}{3},0), (2,0)$ y-int: $(0,-4)$



101. vertex: $(1,-16)$

x-int: $(-3,0), (5,0)$ y-int: $(0,-15)$



102. vertex: $(\frac{7}{2}, -\frac{25}{2})$

x-int: $(1,0), (6,0)$ y-int: $(0,12)$



103. $\{\pm 7\}$

104. $\{\pm 4\}$

105. $\{0,4\}$

106. *no real solutions*

$107. \{5, 8\}$

$108. \{-2, 5\}$

$109. \left\{-\frac{3}{2}\right\}$

$110. \left\{-2, -\frac{2}{3}\right\}$

$111. \left\{-\frac{4}{9}, 6\right\}$