Montini Catholic High School
Algebra I & Geometry Basic Concepts

All students enrolled in Modern Algebra II and Algebra II for the fall of 2022 will take a diagnostic exam the first week of school to assess their retention of basic Algebra I and Geometry concepts that are necessary to be successful in Algebra II. 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.

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 *2022 Summer Mathematics* schoology group

Access Code
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 (a free website)
- Videos and examples on schoology
- 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…) maybe add more of everything (laws of exponents need more)
- Evaluate an algebraic expressions

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.
- points, lines, planes
- Segment & angle addition
- Parallel lines
- Vocabulary section Complementary/supplementary/linear pair, vertical angles…

ALL QUESTIONS ARE INTENDED TO BE COMPLETED WITHOUT A CALCULATOR
All fractions should be simplified and expressed in improper form.

A. Operations with negatives & fractions / simplify numerical expressions
Simplify (Write the value of each expression)

1. $48 - 32 - 26 =$	2. $-6 - 13 =$	3. $(-8)(7) =$
4. $(12)\left(\frac{1}{3}\right) =$	5. $\frac{-24}{-3} =$	6. $\left(\frac{3}{5}\right)\left(\frac{20}{6}\right) =$
7. $\left(\frac{35}{3}\right) \div \left(\frac{5}{27}\right) =$	8. $\frac{3}{2} - \frac{1}{4} =$	9. $2\frac{1}{2} + 3\frac{1}{4} =$
10. $3(2+1)^2 - 4 \cdot 5 =$	11. $\frac{2+3 \cdot 6-4}{3^2-5} =$	12. $6\frac{1}{3} - 2\frac{2}{3} =$

For help go to: *2022 Summer Mathematics* schoology group OR
Khanacademy.org:

- Pre-Algebra
  - Negative numbers
    - Adding and subtracting negative numbers
    - Multiplying and dividing negative numbers
  - Fractions
    - Adding and subtracting fractions with unlike denominators
    - Adding and subtracting mixed numbers
    - Multiplying fractions

B. Absolute Value and Radicals

Simplify (Write the value of each expression

13. $\lvert 3-7\rvert =$	14. $4\lvert -3\rvert =$	15. $2\lvert 3\rvert + 4\lvert -5\rvert =$
16. $-3\lvert 2-5\rvert + 5\lvert -2-3\rvert =$	17. $\frac{3\lvert 2(-7+4)\rvert}{\lvert 1-3\rvert} =$	18. $\sqrt{81} =$
19. $\sqrt{50} =$	20. $\sqrt{18} + \sqrt{8} =$	21. $\sqrt{6^2 + 8^2} =$
22. $(8\sqrt{3})(5\sqrt{2}) =$	23. $\frac{1}{3\sqrt{2}} =$	24. $\sqrt{\frac{49}{8}} =$

For help go to: *2022 Summer Mathematics* schoology group OR
Khanacademy.org:

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

C. Simplifying algebraic expressions (order of operations, like terms, laws exponents,…)
Simplify

25. $4(3x-2y)-5x+7y=$	26. $2x(4x-5y)-3y(-x+7y)=$	27. $\frac{-2x^2+2x-7}{x+1}+\frac{2x^2-3x+6}{x+1}=$
28. $(2x-1)^2-7x^2+14x+1=$	29. $\frac{2}{3}x^{\frac{1}{3}}-y^{\frac{1}{4}}+4x^{\frac{1}{3}}+\frac{1}{4}y^{\frac{1}{4}}=$	30. $(-x-2y)(3x-4y)=$
31. $(2x^4y^5)^3=$	32. $8x^0-2x^3\cdot 4x^9=$	33. $\frac{3x^4y^4}{30x^{13}y^{-2}}=$
34. $(f^{-5})(f^2)(f^{-3})=$	35. $(2^{-3})(3^2)(2^4)(3^{-2})=$	36. $\left(\frac{4p^{-2}q^4}{12p^{-4}q^0}\right)^3$
37. $(2\cdot 5^{-1})^3=$	38. $11^{4x-5}\cdot 11^6=$	39. $\frac{3^{2x}}{3^{5x}}=$

40. $if\ a = -3\ \&\ b = 4$ $then\ a^2 - 3b =$	41. $if\ x = 2\ \&\ y = 0.5$ $then\ -x^2 + (3x - 4y) =$	42. $if\ a = -\frac{3}{2}\ \&\ b = \frac{3}{5}$ $then\ (a+2)^2 - \frac{7}{6}b =$
43. $if\ f(x) = 2x - 4x^2 + 13$ $then\ f(3) =$	44. $if\ \mathrm{f(x)} = \mathrm{x} + 5\ \&\ \mathrm{h(x)} = -3(\mathrm{x} + \mathrm{x}^2)$ $then\ f(2) + h(2) =$	45. $if\ g(a,b) = \frac{4a+2b}{a-3b}$ $then\ g(2,6) =$

For help go to: *2022 Summer Mathematics* schoology group OR Khanacademy.org:

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

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

Solve

46. $7x - 3 = 39$	47. $5 - 6x = 2 + 7x$	48. $2(x - 3) + 7 = 4(x + 1) - 2$
49. $2 - \frac{1}{3}x = 10$	50. $\frac{2}{3}(x - 6) + 1 = 5$	51. $\frac{3x+4}{5} = \frac{x-1}{2}$
52. $3(x + 1) = 2x - (4 - x)$	53. $5 - (x + 3) \geq 2(x + 1)$	54. $-\frac{x}{3} - 12 \leq -8$
55. $\begin{cases} y = -2x + 4 \\ 3x - y = 11 \end{cases}$	56. $\begin{cases} 4x + y = -11 \\ 5x - y = -7 \end{cases}$	57. $\begin{cases} 3x + 6y = 8 \\ 5x - 3y = 9 \end{cases}$

58. $\begin{cases} 4x = 3y + 18 \\ 7x - 2y = 25 \end{cases}$	59. $\begin{cases} -5x + 6y = 5 \\ -3x - 5y = 3 \end{cases}$	60. $\begin{cases} 2x = -9y + 1 \\ 6x + 27y = 3 \end{cases}$

For help go to: *2022 Summer Mathematics* schoology group 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

E. Factor expressions of one variable

Factor completely

61. $x^2 + 5x - 50$	62. $-63x^4 + 63x^3$	63. $18a^4b^2 - 90a^3b^3$
64. $b^2 - 5b - 24$	65. $p^2 + 4p + 3$	66. $-3x^2 - 3x + 6$
67. $5v^2 + 42v + 16$	68. $3b^2 + 17b + 24$	69. $6x^2 + 23x + 10$
70. $x^2 - 16$	71. $4m^2 - 9$	72. $25a^2 + 40a + 16$
73. $8n^3 + 20n^2 + 10n + 25$	74. $10r^3 + 2r^2 + 25r + 5$	75. $15v^2 + 123v - 270$

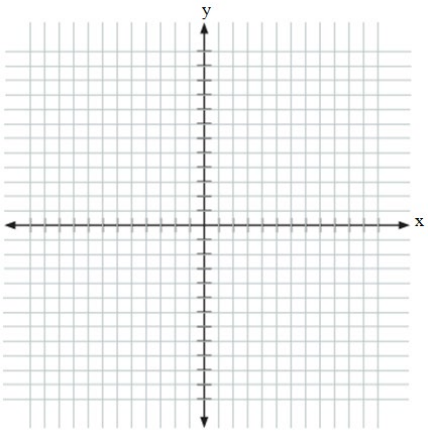
For help go to: *2022 Summer Mathematics* schoology group OR Khanacademy.org:

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

F. Finding x-intercepts, y-intercepts, and graphing linear equations
Write the intercepts of each equation and then sketch the graph

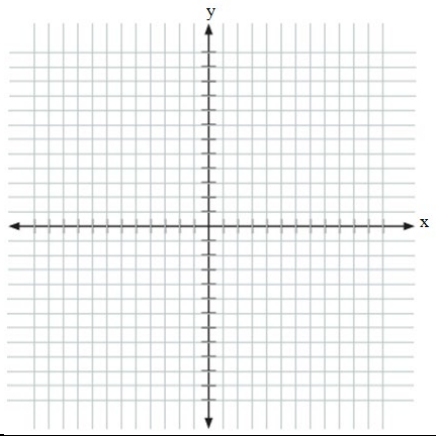
76. $y = 4x - 8$

$x - int$: $y - int$:



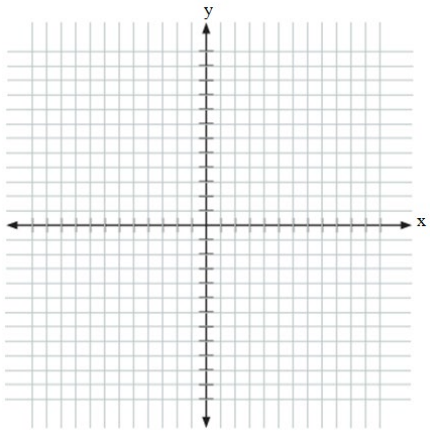
77. $y = -\frac{1}{2}x + 4$

$x - int$: $y - int$:



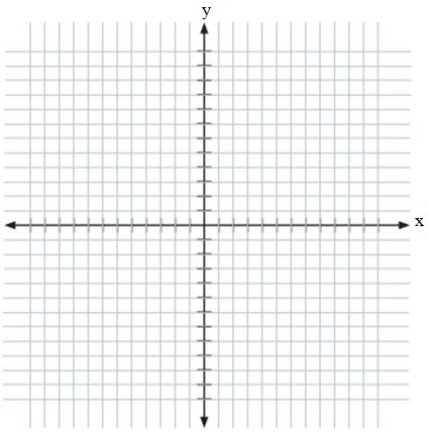
78. $-3x + 4y = 18$

$x - int$: $y - int$:



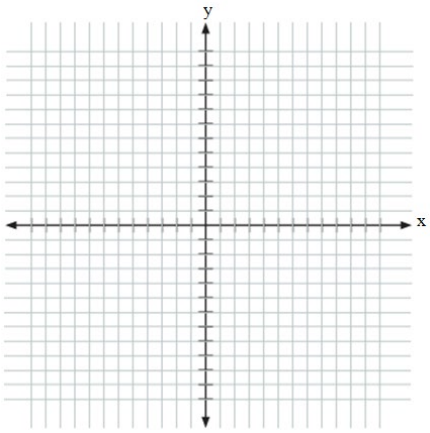
79. $15x - 10y = 40$

$x - int$: $y - int$:



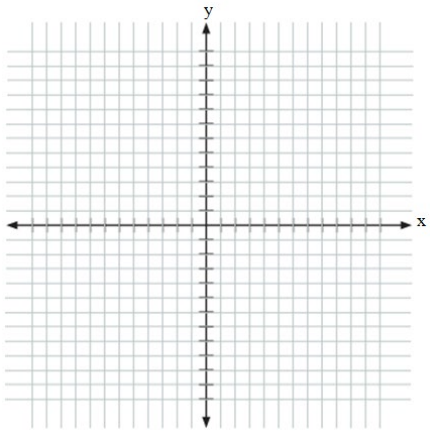
80. $-6x - 2y = 9$

$x - int$: $y - int$:



81. $\frac{1}{2}x - \frac{2}{3}y = 6$

$x - int$: $y - int$:

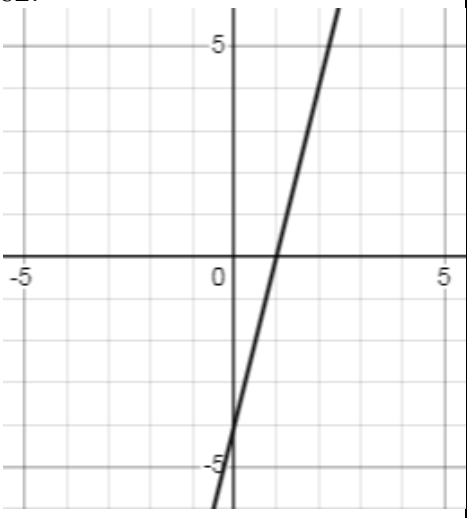


For help go to: *2022 Summer Mathematics* schoology group OR
Khanacademy.org:

- 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

Write the x and y intercepts, slope and equation of the line in the form $y - y_1 = m(x - x_1)$

82.

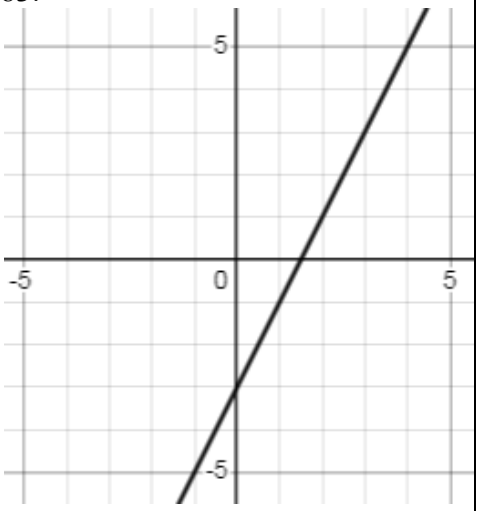


x-int: y-int:

slope:

equation:

83.

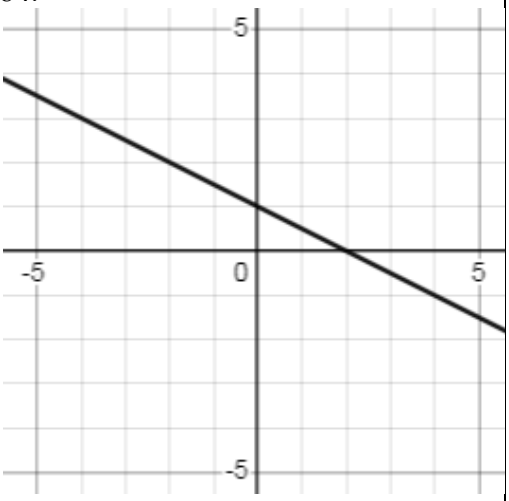


x-int: y-int:

slope:

equation:

84.



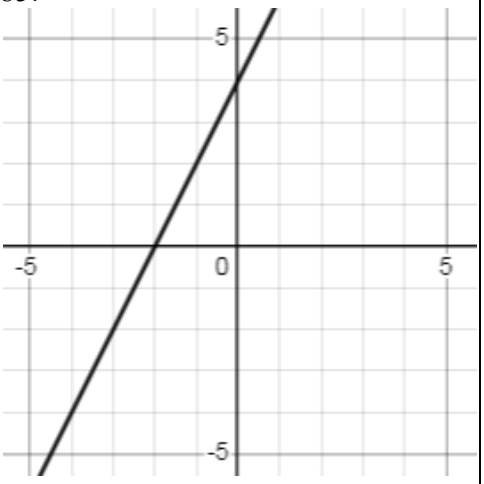
x-int: y-int:

slope:

equation:

Write the x and y intercepts, slope and equation of the line in the form $Ax + By = C$.

85.

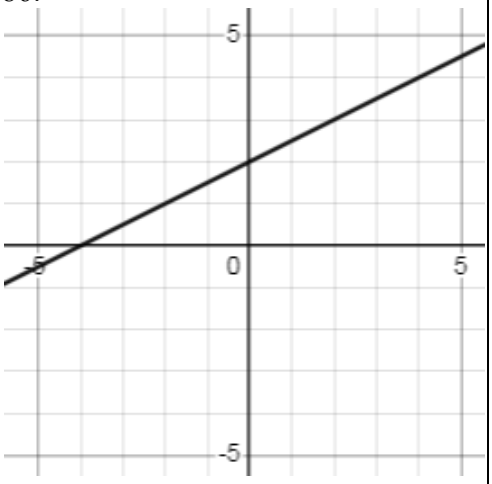


x-int: y-int:

slope:

equation:

86.

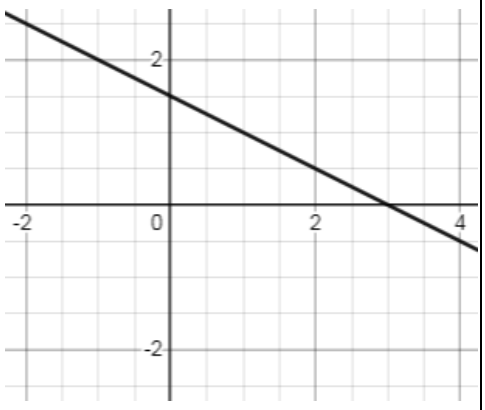


x-int: y-int:

slope:

equation:

87. Pay attention to the scale.



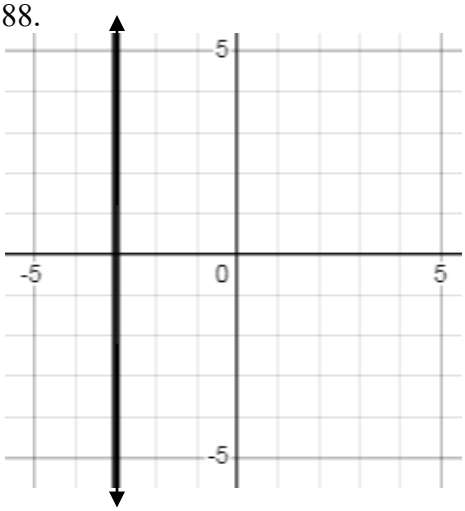
x-int: y-int:

slope:

equation:

Write the x and y intercepts, slope and equation of the line.

88.

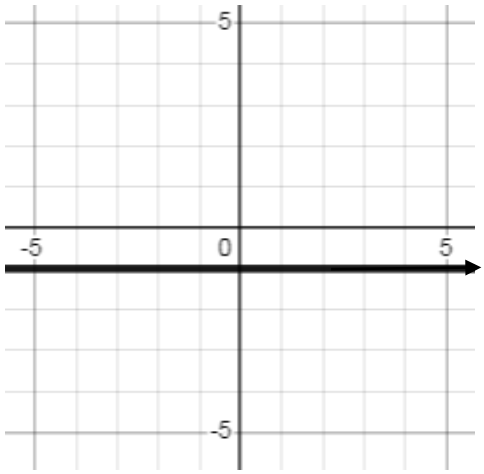


x-int: y-int:

slope:

equation:

89.



x-int: y-int:

slope:

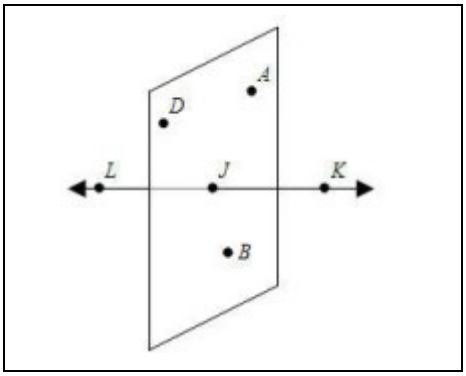
equation:

For help go to: *2022 Summer Mathematics* schoology group OR
Khanacademy.org:

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

G. Basic Geometry: points, lines, planes, segment and angle additions, parallel lines

Use the diagram to answer questions #90-94



90. Name three collinear points

91. Name four coplanar points.

92. What is the intersection of line LK and plane ABD?

93. What is another name for line LK?

94. What is another name for plane ABD?

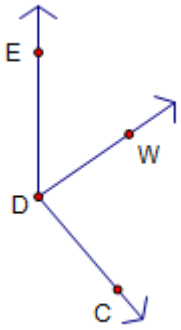
For #95-96 points A, B, and C are collinear and point B is between A and C.

95. Find AC if AB = 12 and BC =7.

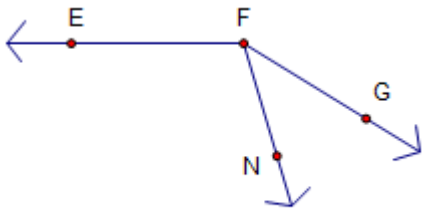
96. Find the value of x if AB = 2x + 1, BC = x + 5, and AC = 24

For #97-98, find the indicated angle measure.

97. Find m∠WDC if m∠EDC = 145° and m∠EDW = 61°



98. m∠GFN = (4x + 10) °, m∠NFE = (14x + 3)° and m∠GFE = 157°. Find m∠NFE.



For 99 – 106, match each geometric word to its best description.

_____99. Supplementary Angles	A. Coplanar lines that do no intersect
_____100. Complementary Angles	B. Opposite and congruent angles formed by 2 intersecting lines.
_____101. Vertical Angles	C. A line/ray/segment that splits an angle into 2 ≅ parts
_____102. Linear Pair	D. Adjacent/supplementary angles formed by 2 intersecting lines.
_____103. Congruent Angles	E. Lines that intersect at right/ 90° angles.
_____104. Angle Bisector	F. Any two angles whose sum is 180°.
_____105. Parallel Lines	G. Any two angles that have the same degree measure.
_____106. Perpendicular Lines	H. Any two angles whose sum is 90°.

ANSWERS:

Part A:

1. -10 2. -19 3. -56 4. 4 5. 8

6. 2 7. 63 8. $\frac{5}{4}$ 9. $\frac{23}{4}$ 10. 7

11. 4 12. $\frac{11}{3}$

Part B:

13. 4 14. 12 15. 26 16. 16 17. 9

18. 9 19. $5\sqrt{2}$ 20. $5\sqrt{2}$ 21. 10 22. $40\sqrt{6}$

23. $\frac{\sqrt{2}}{6}$ 24. $\frac{7\sqrt{2}}{4}$

Part C:

25. 7x – y 26. $8x^2 - 7xy - 21y^2$ 27. -1 28. $-3x^2 + 10x + 2$

29. $\frac{14}{3}x^{\frac{1}{3}} - \frac{3}{4}y^{\frac{1}{4}}$ 30. $-3x^2 - 2xy + 8y^2$ 31. $8x^{12}y^{15}$ 32. $1 - 8x^{12}$

33. $\frac{y^6}{10x^9}$ 34. f^{-6} 35. 2 36. $\frac{1}{27}p^6q^{12}$

37. $\frac{8}{125}$ 38. 11^{4x+1} 39. 3^{-3x} 40. -3

41. 0 42. $-\frac{9}{20}$ 43. -17 44. -11 45. $-\frac{5}{4}$

Part D:

46. 6 47. $\frac{3}{13}$ 48. $-\frac{1}{2}$ 49. -24 50. 12 51. -13 52. No solution

53. $x \leq 0$ 54. $x \geq -12$ 55. $(3, -2)$ 56. $(-2, -3)$ 57. $(2, \frac{1}{3})$ 58. $(3, -2)$ 59. $(-1, 0)$

60. All points (x,y) such that $y = \frac{1-2x}{9}$

Part E:

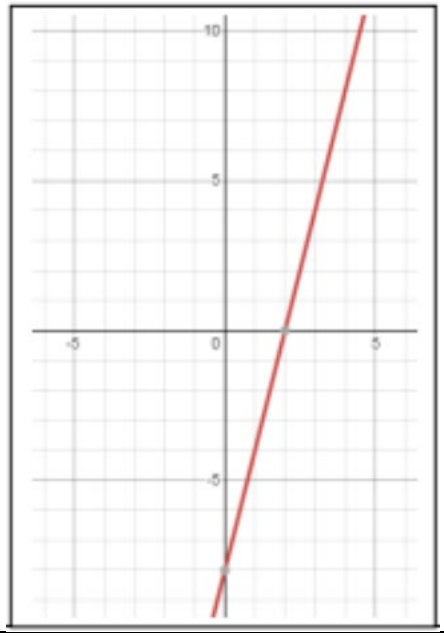
61. (x + 10)(x – 5) 62. $-63x^3(x - 1)$ 63. $18a^3b^2(a - 5b)$ 64. (b – 8)(b + 3) 65. (p + 3)(p + 1)

66. -3(x + 2)(x – 1) 67. (5v + 2)(v + 8) 68. (3b + 8)(b + 3) 69. (2x + 1)(3x + 10) 70. (x + 4)(x – 4)

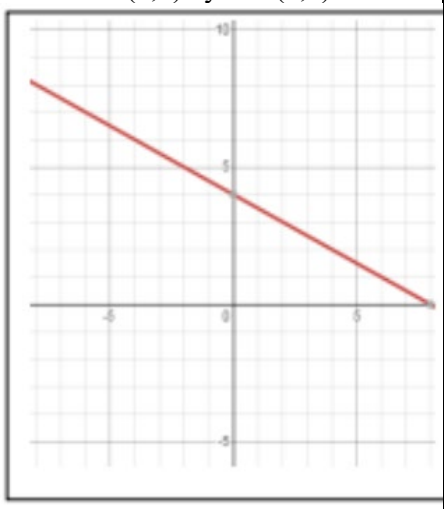
71. (2m – 3)(2m + 3) 72. $(5a + 4)^2$ 73. $(4n^2 + 5)(2n + 5)$74. $(2r^2 + 5)(5r + 1)$ 75. 3(5v – 9)(v + 10)

Part F:

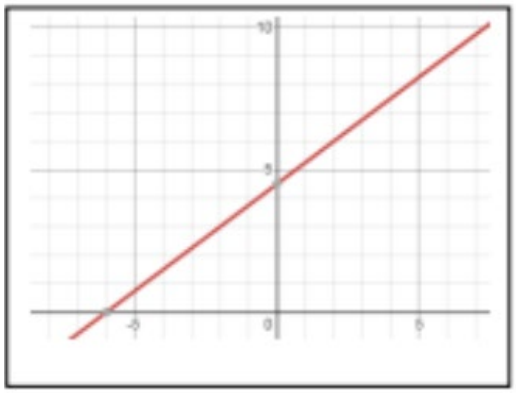
76. x-int: (2,0) y-int: (0,−8)



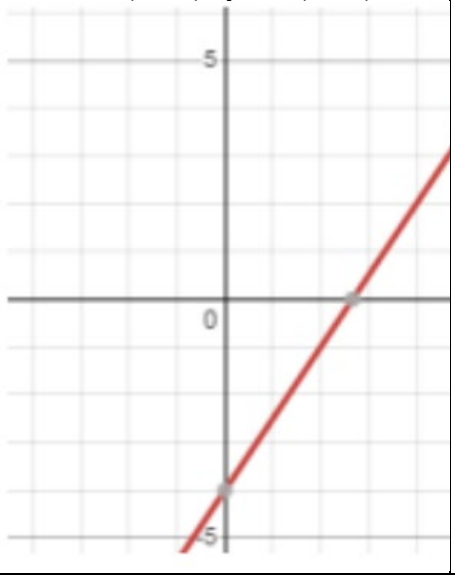
77. x-int: (8,0) y-int: (0,4)



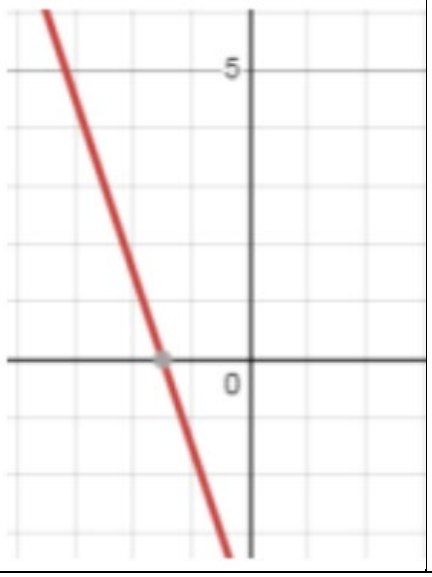
78. x-int: (−6,0) y-int: (0,4.5)



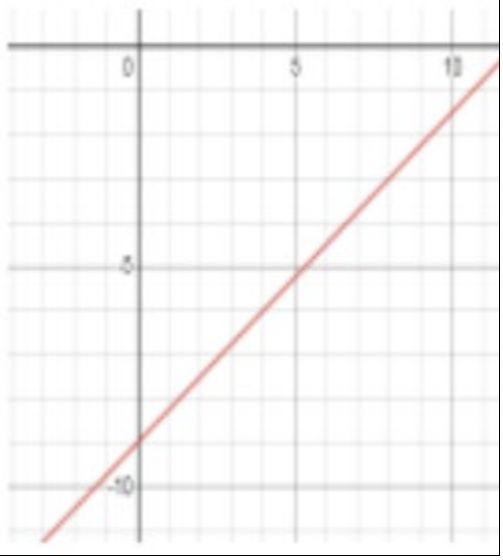
79. x-int: (8/3,0) y-int: (0,−4)



77. x-int: (−1.5,0) y-int: (0,−4.5)



78. x-int: (12,0) y-int: (0,−9)



82. x-int: (1,0) y-int: (0,−4) Slope = 4 Eqn: $y - 0 = 4(x - 1)$	83. x-int: (3/2,0) y-int: (0,−3) Slope = 2 Eqn: $y - 0 = 2(x - \frac{3}{2})$	84. x-int: (2,0) y-int: (0,1) Slope = $-\frac{1}{2}$ Eqn: $y - 0 = -\frac{1}{2}(x - 2)$
85. x-int: (−2,0) y-int: (0,4) Slope = 2 Eqn: $2x - 4y = -4$	86. x-int: (−4,0) y-int: (0,2) Slope = $\frac{1}{2}$ Eqn: $x - 2y = -4$	87. x-int: (3,0) y-int: (0,3/2) Slope = $-\frac{1}{2}$ Eqn: $x + 2y = 3$
88. x-int: (−3,0) y-int: none Slope = undefined Eqn: $x = -3$	89. x-int: none y-int: (0,−1) Slope = 0 Eqn: $y = -1$	

Part G:

90. J, L, & K

91. A, B, D, & J

92. Point J

93. $\overleftrightarrow{LJ}$ $or\overleftrightarrow{JK}$

94. Plane ABJ or ADJ or BDJ

95. 19

96. 6

97. 84°

98. 115°

99. F

100. H

101. B

102. D

103. G

104. C

105. A

106. E