

**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 17th has some high expectations. It is assumed you can...

- (1) follow order of operations appropriately in all situations
- (2) solve a variety of linear, absolute value, & quadratic equations and some 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 2016-17 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 (worth several regular HW assignments). You will also take a quiz on this material on the 3rd day of class. Make sure you start off the year on the right foot!

#1 - 10: Evaluate.

1. $4 + \underline{3} \bullet 4 \div 2 - 9$

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

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

$$10-9$$

$$\boxed{1}$$

3. $4 + 3(\underline{5-6})^2$

$$4+3(-1)^2$$

$$\begin{array}{r} \underline{4+3(1)} \\ 4+3 \\ \hline \boxed{7} \end{array}$$

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

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

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

$$\begin{array}{r} 36-17 \\ \hline \boxed{19} \end{array}$$

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

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

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

$$-9 + 33$$

$$\boxed{24}$$

2. $18 - 12 \div 6 \bullet 2 - 10$

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

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 $a = 3, b = -4$

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

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

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

$$\underline{-4+3}$$

$$\underline{-15}$$

$$\underline{-1}$$

$$\boxed{15}$$

#11 – 18: Simplify.

11. $x - x^2 + 3x^2 + 5x$

$$2x^2 + 6x$$

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

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

13. $6y - 2(3y - 8) + 2y$
 $6y - 6y + 16 + 2y$

$$2y + 16$$

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

15. $(4+x)(x-3)$
 $4x - 12 + x^2 - 3x$

$$x^2 + x - 12$$

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

17. $(2+3x)^2$
 $(2+3x)(2+3x)$
 $4 + 6x + 6x + 9x^2$
 $9x^2 + 12x + 4$

#19 – 40: Solve.

19. $\frac{4x - 3 = 9}{+3 +3}$
 $\frac{4x}{4} = \frac{12}{4}$
 $X = 3$

20. $3 - 5x = 16$

21. $\frac{3x - 6 = 5x + 12}{-3x -3x}$
 $\frac{-6 = 2x + 12}{-12 -12}$
 $-18 = 2x$
 $-9 = X$

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

23. $\frac{-3(2x + 5) = 20}{-6x - 15 = 20}$
 $\frac{+15 +15}{-6x = 35}$
 $\frac{-6 -6}{X = -\frac{35}{6}}$

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

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

$$\begin{array}{r} 8 - 2x = 16 + 2x \\ \underline{-2x \quad +2x} \\ 8 = 16 + 4x \\ \underline{-16 \quad -16} \\ -8 = 4x \\ \underline{4 \quad 4} \\ -2 = x \end{array}$$

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

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

$$\begin{array}{r} 4 - 12x - 18 = 1 \\ \underline{-12x - 14 = 1} \\ \underline{\quad +14 \quad +14} \\ -12x = 15 \\ \underline{-12 \quad -12} \\ x = -\frac{5}{4} \end{array}$$

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

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

$$\begin{array}{r} 15x - 10 + 10 = 10 - 12x \\ \underline{15x \quad +12x} \\ 27x = 10 \\ \underline{27 \quad 27} \\ x = \frac{10}{27} \end{array}$$

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

31. Solve for p : $\frac{I}{rt} = p$

$$\boxed{\frac{I}{rt} = P}$$

32. Solve for m : $R = \frac{1}{2}mn^2$

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

$$\begin{array}{r} 2m + 15 = 12m - 27 \\ \underline{-2m \quad -2m} \\ 15 = 10m - 27 \\ \underline{+27 \quad +27} \\ \frac{42}{10} = \frac{10m}{10} \\ \boxed{\frac{21}{5} = m} \end{array}$$

34. $4 - \frac{5}{6}x = \frac{1}{2}x + 2$

35. $|x + 3| = 5$

$$\begin{array}{r} x+3=5 \text{ or } x+3=-5 \\ -3 \quad -3 \\ \hline x=2 \quad x=-8 \end{array}$$

36. $|x - 6| = 12$

37. $|3 - 2x| = 13$

$$\begin{array}{r} 3-2x=13 \text{ or } 3-2x=-13 \\ -3 \quad -3 \\ \hline -2x=10 \quad -2x=-16 \\ -2 \quad -2 \\ \hline x=-5 \quad x=8 \end{array}$$

38. $22 = |5 - 4x|$

39. $\frac{3+2|x-6|}{-3} = 13$

$$\frac{2|x-6|}{2} = \frac{10}{2}$$

$$|x-6| = 5$$

$$\begin{array}{r} x-6=5 \text{ or } x-6=-5 \\ +6 \quad +6 \\ \hline x=11 \quad x=1 \end{array}$$

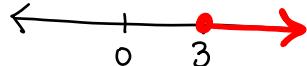
40. $-2|2x+5|-6 = 22$

#41 – 56: Solve and graph on a number line.

41. $x + 4 \geq 7$

$$\begin{array}{r} -4-4 \\ \hline x \geq 3 \end{array}$$

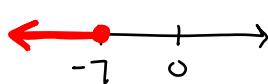
42. $x - 3 < 5$



43. $2x + 5 \leq -9$

$$\begin{array}{r} -5 \quad -5 \\ \hline 2x \leq -14 \\ 2 \quad 2 \\ \hline x \leq -7 \end{array}$$

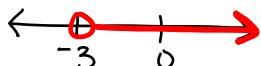
44. $4 + 3x \geq 19$



45. $\frac{3-x < 6}{-3 -3}$

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

$$x > -3$$



46. $2 - 3x \geq 14$

47. $\frac{5x - 6 < 3x + 18}{-3x -3x}$

$$\frac{2x - 6 < 18}{+6 +6}$$

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

$$x < 12$$



48. $3x + 5 > 6x - 12$

49. $\frac{5 < 3 + 2x \leq 11}{-3 -3 -3}$

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

$$1 < x \leq 4$$



50. $19 > 5 - 2x > -7$

51. $4 + 2x < 12 \text{ or } 5 - 2x < -11$

$$\frac{-4 -4}{2x < 8} \quad \frac{-5 -5}{-2x < -16}$$

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



52. $3 - 6x > 15 \text{ or } 5x - 3 \geq 12$

53. $|2x + 1| < 9$

$$\frac{2x + 1 < 9}{-1 -1} \quad \frac{2x + 1 > -9}{-1 -1}$$

$$\frac{2x < 8}{2} \quad \frac{2x > -10}{2}$$

$$x < 4 \quad x > -5$$

$$-5 < x < 4$$



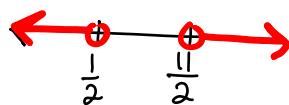
54. $|3x + 5| \geq 20$

55. $2|6 - 2x| > 10$

$$\frac{|6 - 2x| > 5}{-6 -2x \geq 5} \quad \text{or} \quad \frac{6 - 2x < -5}{-6}$$

$$\frac{-2x > -1}{-2} \quad \frac{-2x < -11}{-2}$$

$$x < \frac{1}{2} \quad x > \frac{11}{2}$$



56. $-2 - |1 - 8p| \geq -83$

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

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

$$= \frac{1}{-5}$$

$$= \boxed{-\frac{1}{5}}$$

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

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

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

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

61. Find the x and y -intercepts of

$$3x + 2y = 12$$

$$\underline{x\text{-int}, y=0}$$

$$\underline{y\text{-int}, x=0}$$

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

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

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

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

$$x = 4$$

$$y = 6$$

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

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

63. Find the slope of $3x - 2y = 6$

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

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

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

#65 - 84: Factor.

65. $21xy - 14xz$ GCF

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

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

60. Write in slope-intercept form:

$$4y - 6x = 5y - 12$$

62. Find the x and y -intercepts of

$$4x - 6y = -20$$

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

66. $18a^3 + 4a^2$

68. $24x^4y^5 - 8x^3y^7 + 4x^2y^8$

67. $4x^2y^2z + 6xz^2$ GCF

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

69. $x^2 + 6x + 8$

$$\begin{array}{r} \diagup \quad \diagdown \\ x \quad x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 1 \quad 8 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2 \quad 4 \end{array}$$

$(x+2)(x+4)$

71. $x^2 - 8x + 12$

$$\begin{array}{r} \diagup \quad \diagdown \\ x \quad x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 1 \quad 12 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2 \quad 6 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 3 \quad 4 \end{array}$$

$(x-2)(x-6)$

73. $x^2 - 6x - 16$

$$\begin{array}{r} \diagup \quad \diagdown \\ x \quad x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 1 \quad 16 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2 \quad 8 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 4 \quad 4 \end{array}$$

$(x-8)(x+2)$

75. $2x^2 + 7x + 3$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2x \quad x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 3 \quad 1 \end{array}$$

$(2x+1)(x+3)$

77. $4x^2 - x - 3$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2x \quad 2x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 1 \quad 3 \end{array}$$

$$4x \quad x$$

$(4x+3)(x-1)$

79. $6x^2 - 19x + 15$

$$\begin{array}{r} \diagup \quad \diagdown \\ 6x \quad x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 1 \quad 15 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2x \quad 3x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 3 \quad 5 \end{array}$$

$(2x-3)(3x-5)$

81. $\sqrt{4x^2 - 9}$

$(2x+3)(2x-3)$

83. $4x^2 - 12x + 9$

$$\begin{array}{r} \diagup \quad \diagdown \\ 4x \quad x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 1 \quad 9 \end{array}$$

$$\begin{array}{r} \diagup \quad \diagdown \\ 2x \quad 2x \end{array} \quad \begin{array}{r} \diagup \quad \diagdown \\ 3 \quad 3 \end{array}$$

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

70. $x^2 + 11x + 28$

72. $x^2 - 11x + 24$

74. $x^2 - 3x - 10$

76. $3x^2 + 7x + 2$

78. $4x^2 + 5x - 6$

80. $4x^2 - 8x + 3$

82. $81y^2 - 49$

$(2x-3)(2x-3)$

$(2x-3)^2$

84. $9x^2 - 30x + 25$

#85 - 90: Solve by using the quadratic formula.

85. $x^2 + 15x + 54 = 0$

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

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

87. $6x^2 + x - 35 = 0$

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

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

88. $12x^2 - 26x + 12 = 0$

89. $20x^2 + 19x - 6 = 0$

$$x = \frac{-19 \pm \sqrt{(-19)^2 - 4(20)(-6)}}{2(20)} = \frac{-19 \pm \sqrt{841}}{40}$$

$$= \frac{-19 \pm 29}{40} = \frac{-48}{40} \text{ or } \frac{10}{40} = \boxed{-\frac{6}{5} \text{ or } \frac{1}{4}}$$

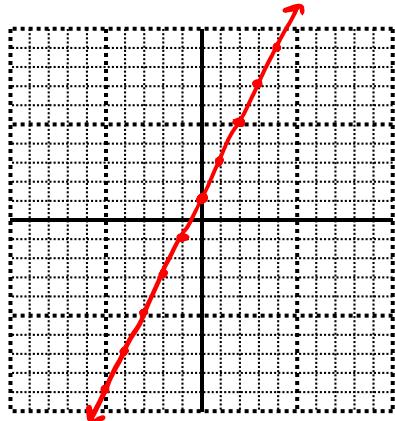
90. $18x^2 = 15x - 2$

#91 - 98: Graph.

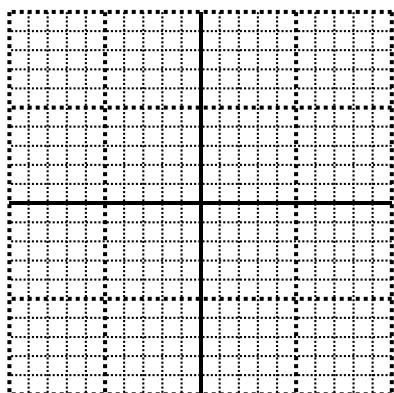
91. $y = 2x + 1$

$m = 2$

$y\text{-int: } (0, 1)$



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

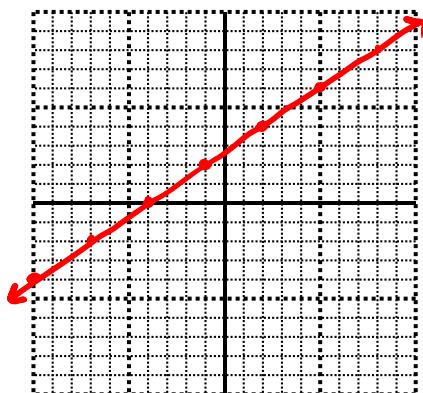


$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

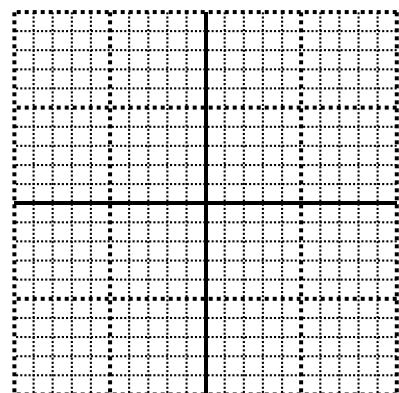
93. $y - 2 = \frac{2}{3}(x + 1)$

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

pt : (-1, 2)

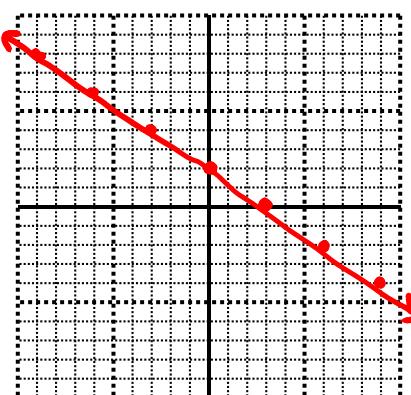


94. $y + 3 = -\frac{3}{4}(x - 4)$

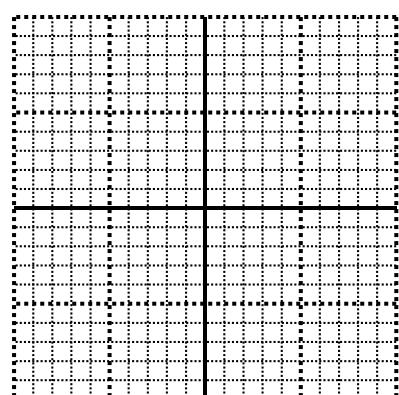


95. $2x + 3y = 6$

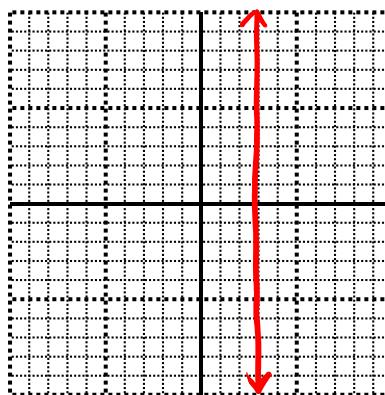
X	4
6	2
3	0



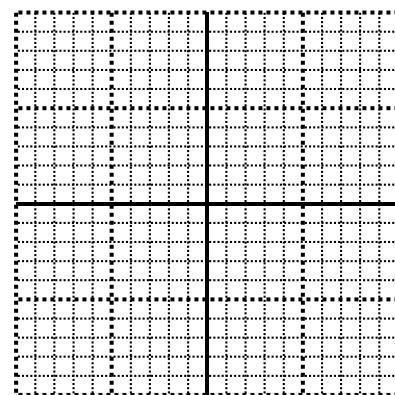
96. $3y + 4x = -12$



97. $x = 3$



98. $y = -4$



#99 – 104: Simplify the square root.

$$99. \sqrt{50} = \sqrt{5 \cdot 5 \cdot 2}$$

$$= \sqrt{5 \cdot 5} \cdot \sqrt{2}$$

$$= \boxed{\sqrt{5} \sqrt{2}}$$

$$\begin{array}{c} 50 \\ \diagup \quad \diagdown \\ 25 \quad 2 \\ \diagup \quad \diagdown \\ 5 \quad 5 \end{array}$$

100. $\sqrt{98}$

$$101. \sqrt{90} = \sqrt{3 \cdot 3 \cdot 2 \cdot 5}$$

$$= \sqrt{3 \cdot 3} \cdot \sqrt{2 \cdot 5}$$

$$= \boxed{3 \sqrt{10}}$$

$$\begin{array}{c} 90 \\ \diagup \quad \diagdown \\ 9 \quad 10 \\ \diagup \quad \diagdown \\ 3 \quad 3 \quad 25 \end{array}$$

102. $\sqrt{132}$

103. $\sqrt{72}$

$$\begin{aligned} &= \sqrt{3 \cdot 3 \cdot 2 \cdot 2 \cdot 2} \\ &= \sqrt{3} \cdot \sqrt{2} \cdot \sqrt{2} \\ &= 3 \cdot 2 \cdot \sqrt{2} \\ &= \boxed{6\sqrt{2}} \end{aligned}$$

$$\begin{array}{c} 72 \\ \wedge \\ 9 \quad 8 \\ \swarrow \quad \searrow \\ 3 \quad 3 \quad 2 \quad 4 \\ \wedge \quad \wedge \\ 2 \quad 2 \end{array}$$

104. $\sqrt{675}$

#105 - 112: Use the properties/rules of exponents to simplify the expression.

105. $3x^2 \cdot 7x^5$

$$\begin{array}{c} \cancel{3} \cdot \cancel{x^2} \\ \cancel{7} \cdot x^5 \\ \hline 21 \cdot x^7 \end{array}$$

106. $10x^3 \cdot 4x^{-1}$

107. $(x^3y^3)^2$

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

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

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

109. $\frac{x^7y^5}{x^5y^6} = \frac{x^{7-5}}{y^{6-3}}$

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

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

$$= \boxed{\frac{c^{14}}{3^2 a^8 b^6}}$$

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

#113:- Perform the given operations for the functions...

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

$$\begin{aligned} 113. \quad & f(x) + g(x) \\ &= (3x-5) + (-x^2+2x-7) \\ &= \boxed{3x-5-x^2+2x-7} \\ &= \boxed{-x^2+5x-12} \end{aligned}$$

$$114. \quad g(x) + h(x)$$

$$\begin{aligned} 115. \quad & h(x) - g(x) \\ &= (-2x+1) - (-x^2+2x-7) \\ &= \boxed{-2x+1+x^2} \boxed{-2x+7} \\ &= \boxed{x^2-4x+8} \end{aligned}$$

$$116. \quad g(x) - f(x)$$

$$\begin{aligned} 117. \quad & f(x) \bullet g(x) \\ &= (\overbrace{3x-5}^{\text{underbrace}})(\overbrace{-x^2+2x-7}^{\text{underbrace}}) \\ &= -3x^3 + \cancel{6x^2} - \cancel{21x} + \cancel{5x^2} \cancel{- 10x} + 35 \\ &= \boxed{-3x^3 + 11x^2 - 31x + 35} \end{aligned}$$

$$118. \quad f(x) \bullet h(x)$$

$$\begin{aligned} 119. \quad & f(-3) = 3(-3) - 5 \\ & f(-3) = -9 - 5 \\ & \boxed{f(-3) = -14} \end{aligned}$$

$$120. \quad g(-5)$$

EVEN ANSWERS (in order):

4	8	25	17	$\frac{5}{4}$	$-2x^2 + 2x$
$2m^2 - m$	$6x^2 - 5x - 4$	$4x^2 - 20x + 25$	$x = -\frac{13}{5}$	$x = \frac{5}{6}$	$x = -1$
$x = -\frac{26}{7}$	$x = -\frac{7}{2}$	$x = -\frac{29}{50}$	$m = \frac{2R}{n^2}$	$x = \frac{3}{2}$	$x = 18, x = -6$
$x = -\frac{17}{4}, x = \frac{27}{4}$	No solution	$x < 8$	$x \geq 5$	$x \leq -4$	$x < \frac{17}{3}$
$-7 < x < 6$	$x < -2$ or $x \geq 3$	$x \geq 5$ or $x \leq -\frac{25}{3}$	$p \geq -10$ or $p \leq \frac{41}{4}$	$-\frac{4}{3}$	$y = -6x + 12$
x - int: $(-5, 0)$ y - int: $(0, \frac{10}{3})$	$-\frac{7}{5}$	$2a^2(9a+2)$	$4x^2y^5(6x^2 - 2xy^2 + y^3)$	$(x+7)(x+4)$	$(x-8)(x-3)$
$(x-5)(x+2)$	$(3x+1)(x+2)$	$(4x-3)(x+2)$	$(2x-3)(2x-1)$	$(9y+7)(9y-7)$	$(3x-5)^2$
$x = 6, x = -11$	$x = \frac{3}{2}, x = \frac{2}{3}$	$x = \frac{2}{3}, x = \frac{1}{6}$	A line through $(0, -2)$ and $(4, -5)$	A line through $(4, -3)$ and $(8, -6)$	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
$\frac{b^3c^6}{2^3a^{12}}$	$-x^2 - 6$	$-x^2 - x - 2$	$-6x^2 + 13x - 5$	-42	\odot