

ADVANCED ALGEBRA HONORS SUMMER WORK

****THE WORK SHOWN IN THIS PACKET IS ONE METHOD. PLEASE USE ANOTHER METHOD IF IT IS MORE COMFORTABLE FOR YOU.**

YOUR NAME: _____

Directions: The concepts covered in this packet are skills that students should have mastered in your previous Algebra course. 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 16th 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 2017-18 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.desmos.com>

<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 16th). You will also take a NO CALCULATOR quiz on this material on the THIRD day of class (August 18th). Make sure you start off the year on the right foot!

#1 - 10: Evaluate showing work. (No Calculator)

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

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

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

$$10 - 9$$

$$\boxed{1}$$

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

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

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

$$4 + 3$$

$$\boxed{7}$$

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

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

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

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

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

$$36 - 17$$

$$\boxed{19}$$

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

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

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

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

$$-9 + 33$$

$$\boxed{24}$$

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

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

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

$$-12 - 3$$

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

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

$$\underline{-15}$$

$$\underline{-1}$$

$$\boxed{15}$$

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

#11 - 18: Simplify each expression showing work. (No Calculator)

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

$$2x^2 + 5x$$

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

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

$$6y - 6y + 16 + 2y$$

$$2y + 16$$

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

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

$$4x - 12 + x^2 - 3x$$

$$x^2 + x - 12$$

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

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

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

$$4 + 6x + 6x + 9x^2$$

$$9x^2 + 12x + 4$$

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

#19 - 40: Solve each equation showing work. (No Calculator)

19. $4x - 3 = 9$

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

$$x = 3$$

20. $3 - 5x = 16$

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

$$\begin{array}{r} -3x \quad -3x \\ \hline -6 = 2x + 12 \\ -12 \quad -12 \end{array}$$

$$-18 = 2x$$

$$-9 = x$$

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

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

$$-6x - 15 = 20$$

$$\frac{-6x = 35}{+15 \quad +15}$$

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

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

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

$$\begin{aligned}
 25. \quad 2(4-x) &= 16+2x \\
 8-2x &= 16+2x \\
 +2x \quad +2x & \\
 \hline
 8 &= 16+4x \\
 -16 \quad -16 & \\
 \hline
 -8 &= 4x \\
 \frac{-8}{4} &= \frac{4x}{4} \\
 -2 &= x
 \end{aligned}$$

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

$$\begin{aligned}
 27. \quad 4-3(4x+6) &= 1 \\
 4-12x-18 &= 1 \\
 -12x-14 &= 1 \\
 +14 \quad +14 & \\
 \hline
 -12x &= 15 \\
 \frac{-12x}{-12} &= \frac{15}{-12} \\
 x &= -\frac{5}{4}
 \end{aligned}$$

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

$$\begin{aligned}
 29. \quad 5(3x-2)+10 &= 2(5-6x) \\
 15x-10+10 &= 10-12x \\
 15x &= 10-12x \\
 +12x \quad +12x & \\
 \hline
 27x &= 10 \\
 \frac{27x}{27} &= \frac{10}{27} \\
 x &= \frac{10}{27}
 \end{aligned}$$

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

$$\begin{aligned}
 31. \quad \text{Solve for } b_1: \quad 2 \cdot A &= \frac{h(b_1+b_2)}{2} \\
 \frac{2A}{h} &= \frac{h(b_1+b_2)}{h} \\
 \frac{2A}{h} &= b_1 + b_2 \\
 -b_2 & \\
 \frac{2A}{h} - b_2 &= b_1
 \end{aligned}$$

$$32. \quad \text{Solve for } h: \quad A = \frac{h(b_1+b_2)}{2}$$

$$\begin{aligned}
 33. \quad \left(\frac{2}{3}m+5=4m-9\right) \cdot 3 \\
 2m+15 &= 12m-27 \\
 -2m \quad -2m & \\
 \hline
 15 &= 10m-27 \\
 +27 \quad +27 & \\
 \hline
 42 &= 10m \\
 \frac{42}{10} &= \frac{10m}{10} \\
 \frac{21}{5} &= m
 \end{aligned}$$

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

$$35. |x+3|=5$$

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

$$36. |x-6|=12$$

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

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

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

$$39. 3+2|x-6|=13$$

$$\begin{array}{r} 3+2|x-6|=13 \\ -3 \quad -3 \\ \hline 2|x-6|=10 \\ \frac{2|x-6|}{2} = \frac{10}{2} \\ |x-6|=5 \end{array}$$

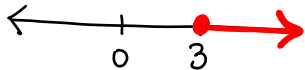
$$\begin{array}{r} x-6=5 \\ +6 \quad +6 \\ \hline x=11 \end{array} \quad \text{or} \quad \begin{array}{r} x-6=-5 \\ +6 \quad +6 \\ \hline x=1 \end{array}$$

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

#41 - 56: Solve and graph on a number line. (No Calculator)

$$41. x+4 \geq 7$$

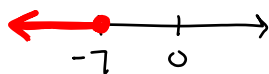
$$\begin{array}{r} x+4 \geq 7 \\ -4 \quad -4 \\ \hline x \geq 3 \end{array}$$



$$42. x-3 < 5$$

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

$$\begin{array}{r} 2x+5 \leq -9 \\ -5 \quad -5 \\ \hline 2x \leq -14 \\ \frac{2x}{2} \leq \frac{-14}{2} \\ x \leq -7 \end{array}$$

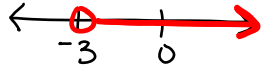


$$44. 4+3x \geq 19$$

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

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

$$x > -3$$



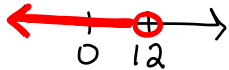
$$46. 2 - 3x \geq 14$$

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

$$\frac{2x-6}{+6+6} < \frac{3x+18}{+6+6}$$

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

$$x < 12$$



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

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

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

$$1 < x \leq 4$$

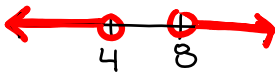


$$50. 19 > 5 - 2x > -7$$

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

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

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



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

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

$$-9 < 2x+1 < 9$$

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

$$-5 < x < 4$$

$$-5 < x < 4$$



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

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

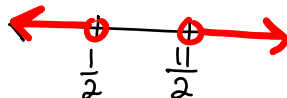
$$|6-2x| > 5 \text{ or } \frac{6-2x}{-6} < \frac{-5}{-6}$$

$$\frac{-6-2x}{-6} > \frac{5}{-6}$$

$$x < \frac{1}{2}$$

$$\frac{-2x}{-2} < \frac{-11}{-2}$$

$$x > \frac{11}{2}$$



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

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: $y = mx + b$

$$3x - 2y = 4x - 7$$

$$-3x \quad -3x$$

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

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

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

60. Write in slope-intercept form:

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

61. 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

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

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

$$y = 6$$

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

62. Find the coordinates of the x and y - intercepts of

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

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

$$-3x \quad -3x$$

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

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

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

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

#65 - 84: Factor. (No Calculator)

65. $21xy - 14xz$ GCF

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

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

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

$$2xz(2xy^2 + 3z)$$

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

$$69. \begin{array}{c} x^2 + 6x + 8 \\ \wedge \quad \wedge \\ x \ x \quad 1 \ 8 \\ \quad \quad 2 \ 4 \end{array}$$

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

$$71. \begin{array}{c} x^2 - 8x + 12 \\ \wedge \\ -6 \ -2 \end{array}$$

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

$$73. \begin{array}{c} x^2 - 6x - 16 \\ \wedge \\ -8 \ 2 \end{array}$$

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

$$75. \begin{array}{c} 6 \\ \overbrace{2x^2 + 7x + 3}^{6 \cdot 1} \\ \left(\frac{2x^2 + 6x}{2x} \right) + \left(\frac{x+3}{1} \right) \\ 2x(x+3) + 1(x+3) \\ \underline{(2x+1)(x+3)} \end{array}$$

You can also do guess and check.

$$77. \begin{array}{c} -12 \\ \overbrace{4x^2 - x - 3}^{-4 \cdot 3} \\ \left(\frac{4x^2 - 4x}{4x} \right) + \left(\frac{3x - 3}{3} \right) \\ 4x(x-1) + 3(x-1) \\ \underline{(4x+3)(x-1)} \end{array}$$

$$79. \frac{5x^2}{5} - \frac{125y^2}{5}$$

$$5(\sqrt{x^2 - 25y^2})$$

$$5(x+5y)(x-5y)$$

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

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

$$83. \begin{array}{c} 36 \\ \overbrace{4x^2 - 12x + 9}^{-6 \cdot -6} \\ \left(\frac{4x^2 - 6x}{2x} \right) + \left(\frac{-6x + 9}{-3} \right) \\ 2x(2x-3) + -3(2x-3) \end{array}$$

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

$$\text{or}$$

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

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

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

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

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

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

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

$$80. 3h^2 - 27m^2$$

$$82. 81y^2 - 49$$

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

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

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

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

$$x = \frac{-15 \pm \sqrt{(15)^2 - 4(1)(54)}}{2(1)} = \frac{-15 \pm \sqrt{9}}{2}$$
$$= \frac{-15 \pm 3}{2} = \frac{-12}{2} \text{ or } \frac{-18}{2} = \boxed{-6 \text{ or } -9}$$

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

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. $20x^2 + 19x = 6$
 $\quad \quad \quad -6 \quad -6$

$$20x^2 - 19x - 6 = 0$$
$$x = \frac{-19 \pm \sqrt{(-19)^2 - 4(20)(-6)}}{2(20)} = \frac{-19 \pm \sqrt{841}}{40}$$
$$= \frac{-19 \pm 29}{40} = \frac{-48}{40} \text{ or } \frac{10}{40} = \boxed{-\frac{6}{5} \text{ or } \frac{1}{4}}$$

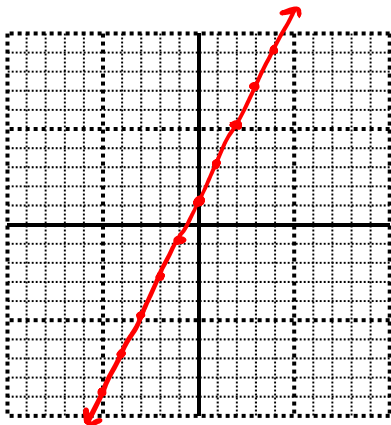
90. $18x^2 = 15x - 2$

#91 - 98: Graph.

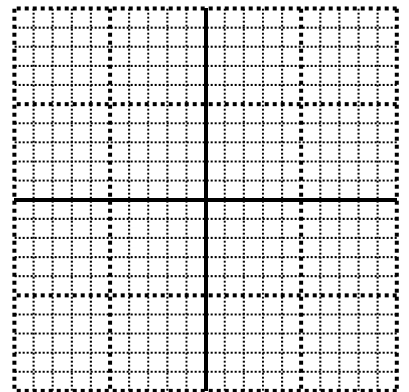
91. $y = 2x + 1$

$m = 2$

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

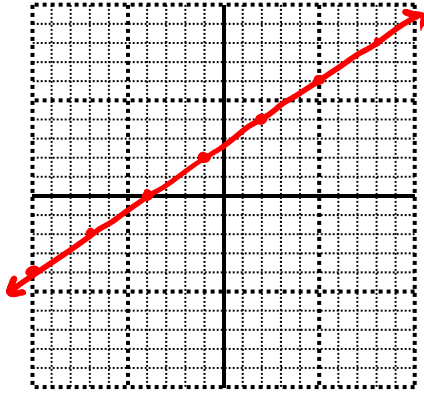


92. $y = -\frac{3}{4}x - 2$

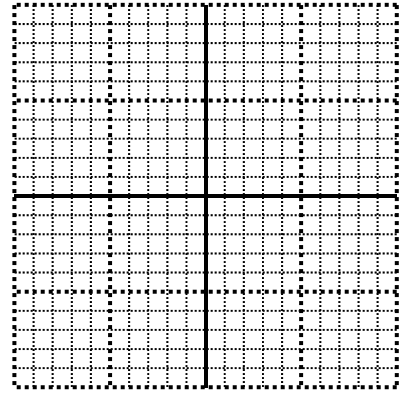


93. $y - 2 = \frac{2}{3}(x + 1)$

$m = \frac{2}{3}$
 Pt: $(-1, 2)$



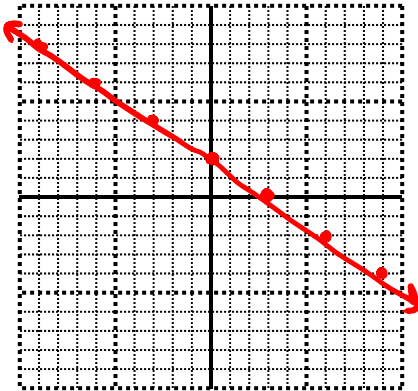
94. $y + 3 = -\frac{3}{4}(x - 4)$



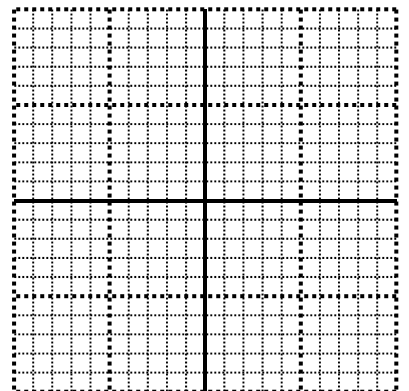
95. $2x + 3y = 6$

x-Int
 $2x + 3(0) = 6$
 $2x = 6$
 $x = 3$ $(3, 0)$

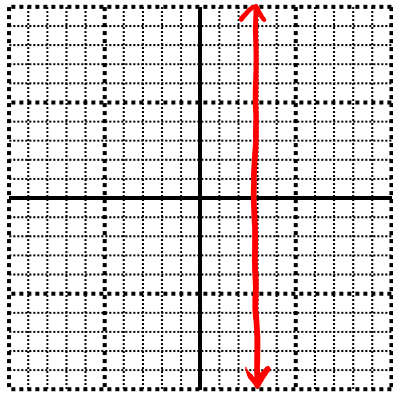
y-Int
 $2(0) + 3y = 6$
 $3y = 6$
 $y = 2$ $(0, 2)$



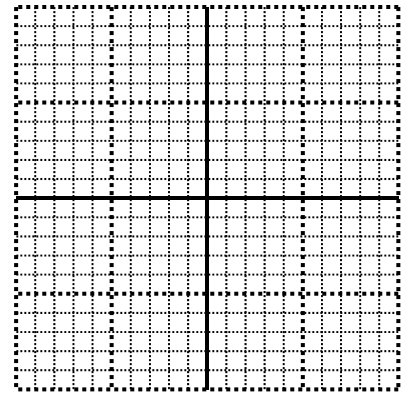
96. $3y + 4x = -12$



97. $x = 3$



98. $y = -4$



#99 - 104: Simplify the square root.

99. $\sqrt{50}$
 $\sqrt{25 \cdot 2}$
 $\sqrt{25} \sqrt{2}$
 $5\sqrt{2}$

100. $\sqrt{98}$

101. $\sqrt{90}$
 $\sqrt{9 \cdot 10}$
 $\sqrt{9} \sqrt{10}$
 $3\sqrt{10}$

102. $\sqrt{132}$

$$103. \sqrt{72}$$

$$\sqrt{36 \cdot 2}$$

$$\sqrt{36} \sqrt{2}$$

$$\boxed{6\sqrt{2}}$$

$$104. \sqrt{675}$$

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

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

$$\cancel{21 \cdot x^7}$$

$$\boxed{21x^7}$$

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

$$107. (x^{-3}y^3)^2$$

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

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

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

$$109. \frac{x^7y^3}{x^5y^6} = \frac{x^{7-5}y^{3-6}}{1}$$

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

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

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

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

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

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

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

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

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

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

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

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

$$117. f(x) \cdot g(x)$$

$$\begin{aligned} &= (3x-5)(-x^2+2x-7) \\ &= -3x^3 + 6x^2 - 21x + 5x^2 - 10x + 35 \\ &= \boxed{-3x^3 + 11x^2 - 31x + 35} \end{aligned}$$

$$118. f(x) \cdot h(x)$$

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

$$120. g(-5)$$

→ → → → → →

EVEN ANSWERS (in order from left to right)

4	8	25	17	$\frac{5}{4}$	$-2x^2 + 2x$
$2m^2 - m$	$6x^2 - 5x - 4$	$4x^2 - 20x + 25$	$x = -\frac{13}{5}$	$x = \frac{5}{6}$	$x = -1$
$x = -\frac{26}{7}$	$x = -\frac{7}{2}$	$x = -\frac{29}{50}$	$h = \frac{2A}{b_1 + b_2}$	$x = \frac{3}{2}$	$x = 18, x = -6$
$x = -\frac{17}{4}, x = \frac{27}{4}$	No solution	$x < 8$	$x \geq 5$	$x \leq -4$	$x < \frac{17}{3}$
$-7 < x < 6$	$x < -2$ or $x \geq 3$	$-\frac{25}{3} \leq x \leq 5$	$p \geq -10$ or $p \leq \frac{41}{4}$	$-\frac{4}{3}$	$y = -6x + 12$
x - int: $(-5, 0)$ y - int: $(0, \frac{10}{3})$	$-\frac{7}{5}$	$2a^2(9a + 2)$	$4x^2y^5(6x^2 - 2xy^2 + y^3)$	$(x + 7)(x + 4)$	$(x - 8)(x - 3)$
$(x - 5)(x + 2)$	$(3x + 1)(x + 2)$	$(4x - 3)(x + 2)$	$3(h + 3m)(h - 3m)$	$(9y + 7)(9y - 7)$	$(3x - 5)^2$
$x = 6, x = -11$	$x = \frac{3}{2}, x = \frac{2}{3}$	$x = \frac{2}{3}, x = \frac{1}{6}$	A line through $(0, -2)$ and $(4, -5)$	A line through $(4, -3)$ and $(8, -6)$	A line through $(-3, 0)$ and $(0, -4)$
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