

Name: _____

Preparing for PreCalculus

You should NOT use a graphing calculator to complete this packet, unless the directions note that you can use one.

The purpose of the packet is to help you review and reinforce concepts/topics that are necessary for PreCalculus. This packet has been designed to provide a review of Algebra I and Algebra II skills that are essential for student success in PreCalculus. Completion of this packet over the summer will be of great value to helping students successfully meet the academic challenges awaiting them in PreCalculus.

Instructions:

It is highly suggested that you complete all sections of this packet. You will show this completed packet to your PreCalculus teacher the first day of school. All work must be shown and final answers should be circled. Students must show work that supports their understanding

It may be necessary to seek assistance on some questions/concepts.



Algebra I and Algebra II Topics

Factoring Polynomials

Factoring by GCF

Factoring $x^2 + bx + c$ and $ax^2 + bx + c$

Factoring by Grouping

Factoring Special Products

Multiplying Polynomials

Solving Polynomial Equations

Functions

Graphing Transformations of Parent Functions

Writing Rules for Transformations

Evaluating Functions

Finding Domain and Range

Determining Increasing and Decreasing Ranges

Rational Expressions and Equations

Simplifying Complex Fractions

Simplifying Rational Expressions

Adding and Subtracting Rational Expressions

Multiplying and Dividing Rational Expressions

Solving Equations Involving Rational Expressions

Complex Numbers

Adding and Subtracting Complex Numbers

Multiplying and Dividing Complex Numbers

Logarithms

Evaluating Logarithmic Expressions

Expanding and Condensing Logarithms

Solving Logarithmic Equations

Trigonometry

Converting Between Degrees and Radians

Using Basic Trigonometric Ratios

Factor each polynomial completely.

1. $9x^3 + 3x^2 + 12x$	2. $-2x^2y + 16xy - 6y$
3. $25a^2c - 5ac^2$	4. $49xy^2 + 7xy - 14x^2y$
5. $-4ab - 16abc - 12a^2bc$	6. $x^2 + 8xy + 12y^2$
7. $x^2 + 5x - 6$	8. $x^2 - 5x + 6$
9. $x^2 - 4x - 12$	10. $x^2 + 11x + 28$
11. $3x^2 + 11x + 6$	12. $7x^2 - 12x + 5$
13. $10a^2 + 23a + 12$	14. $9n^2 - 24n + 16$

15. $-4a^2 - 4ac - a$	16. $2a^2 - 8ab - 4a - 4b$
17. $6v^3 - 16v^2 + 21v - 56$	18. $8r^3 - 64r^2 + r - 8$
19. $12x^3 + 2x^2 - 30x - 5$	20. $42mc + 36md - 7n^2c - 6n^2d$
21. $4a^2 - 9b^2$	22. $1 - 25f^2$
23. $3x^4 - 27x^2y^2$	24. $36x^2 - y^2$

**Solve each equation by factoring, using square roots, or using the quadratic formula.
Check your answer.**

25. $3a^2 - 24a = 0$	26. $2x^2y + 4xy + 2y = 0$
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27. $-6k = -9 - k^2$	28. $x^2 - 2x = 8$
29. $2x^2 - 11x + 14 = 0$	30. $3y^2 + 11y + 6 = 0$
31. $8ab + 6b - 12a - 9 = 0$	32. $2x^3 + 3x^2 - 18x = 27$
33. $x^2 - 49 = 0$	34. $4x^2 + 64 = 0$
35. $81x^2 = 289$	36. $9x^2 = 729$
37. $3y^2 + 7y + 3 = 0$	38. $x^2 + 6x = -6$

39. $2x^2 + 2x + 3 = 0$	40. $b^2 + 7b = 20$
41. $2n^2 - 2n + 7 = 0$	42. $5a^2 - 12a + 3 = 0$
43. $9y^4 - 7y^2 = 16$	44. $m^2 - 5m - 12 = 0$
45. $16x^2 - 40x + 25 = 0$	46. $2x^4 + 6x^3 - 8x^2 - 24x = 0$
47. $x^4 + 20x^3 + 100x^2 = 0$	48. $3n^4 - 18n^3 - 27n^2 + 162n = 0$
49. $5x^2 + 125 = 0$	50. $18x^2 + 23 = 9x^2 + 3(3x^2 + 2)$

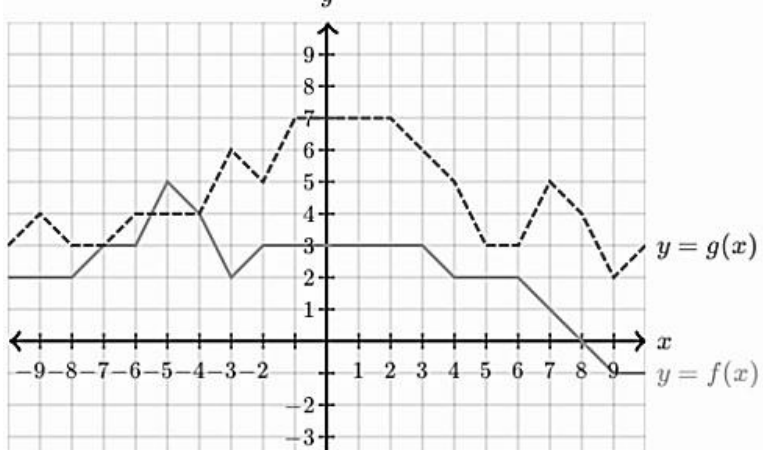
Simplify the complex fractions.

51. $\frac{\frac{36}{u^2}}{\frac{1}{2} + \frac{u}{12}}$	52. $\frac{\frac{x}{2x+8} - \frac{x+4}{x^2}}{\frac{x^2}{x+4}}$
53. $\frac{\frac{1}{4} + \frac{1}{9}}{\frac{6}{x+5} + \frac{4}{x}}$	54. $\frac{\frac{3}{16} + \frac{9}{x+5}}{\frac{4}{x} + \frac{4}{x}}$

Evaluate the functions.

55. Find $p(-10)$, given $p(x) = - x+2 $	56. Find $g(2)$, given $g(x) = 2 \cdot 3^{2x-2} + 3$
57. Find $h(3n)$, given $h(n) = n^3 + 2 + n$	58. Find $f(a+4)$, given $f(a) = 3a+1$

Use the graph to evaluate.

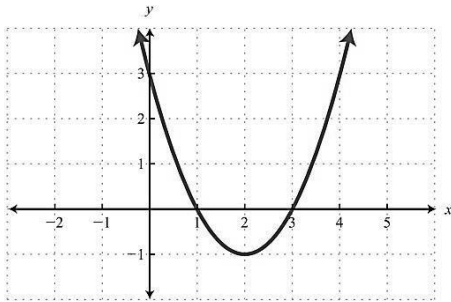
	59. $g(-3)$ 60. $f(9)$ 61. $g(-8) + f(-5)$ 62. $f(6) - f(-4)$ 63. $f(g(7))$ 64. $g(g(8))$
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Give the domain and range of each function.

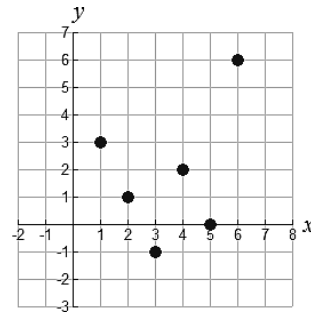
65. $f(x) = 2|x - 5| + 1$

66. $g(x) = \sqrt{16 - x^2}$

67.



68.

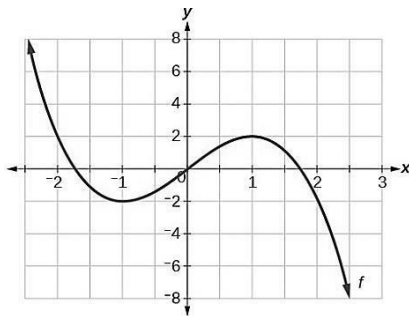


State where the function is increasing and decreasing.

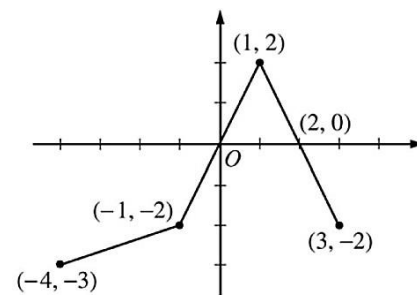
69. $h(x) = x^3 - 5$

70. $p(x) = -\frac{1}{2}(x+3)^2 - 7$

71.



72.



Multiply and simplify.

73. $-3x(2x^2 - 5)$

74. $(3x - 5)(4x + 7)$

75. $(x-3y)(x+3y)$	76. $(x-1)(x^2+x+1)$
77. $(5x-2)^2$	78. $(x+4)^3$
79. $(x^2+4x-6)(x^2-2x-9)$	80. $(3xy^5)^4$

Simplify.

81. $(5-3i)+(8+2i)$	82. $5+7i-10-13i$
83. $-2+(7+4i)+5i$	84. $5+3(2-6i)$
85. $(11+6i)-(4-8i)$	86. $9-(5+3i)+2i$

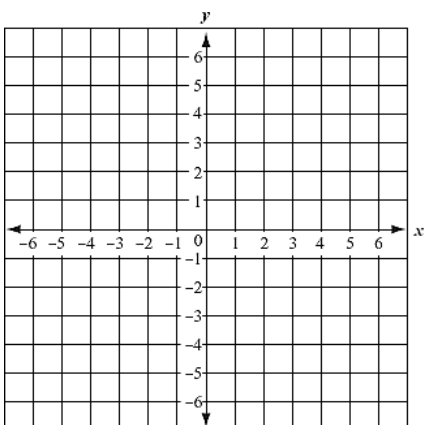
87. $-6-8(-1-5i)$	88. $(-4+5i)-(-4-9i)$
89. $5i(-4+i)$	90. $(4-3i)(5+i)$
91. $(6-2i)(6+2i)$	92. $(5-7i)^2$
93. $\frac{8}{3i}$	94. $-\frac{4}{i}$
95. $\frac{5}{-7i}$	96. $\frac{2+5i}{9i}$
97. $\frac{5}{2+i}$	98. $\frac{6}{3-4i}$

99. $\frac{2+7i}{6-i}$

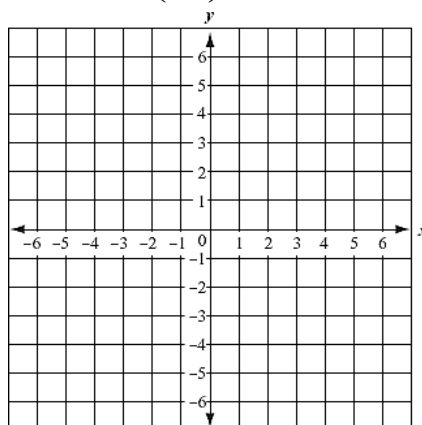
100. $\frac{1+3i}{5+8i}$

Graph the following core graphs and the given transformation on the same coordinate grid.

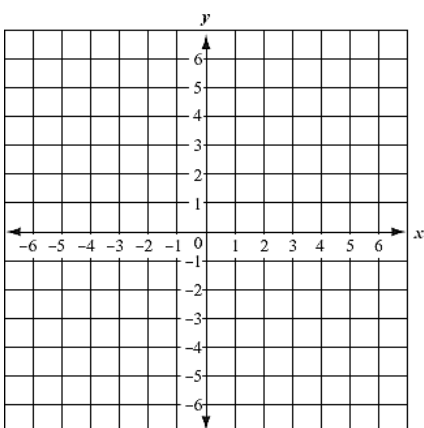
101. $f(x) = x^2$; $g(x) = \frac{1}{2}x^2 - 1$



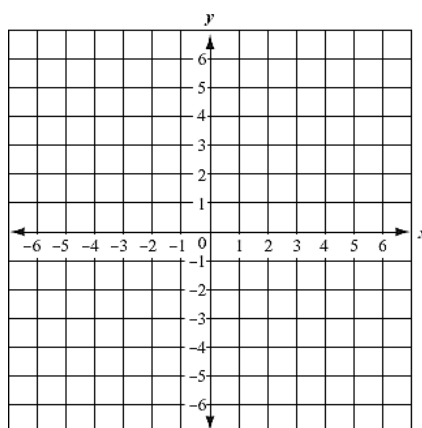
102. $y = x^3$; $y = -\left(\frac{1}{3}x\right)^3$



103. $y = \log x$; $y = \log(x-2)$



104. $y = \sqrt{x}$; $y = \sqrt{2x}$



Write a rule for $g(x)$ given the following transformations of the given parent function.

105. Let the graph of g be a horizontal stretch by a factor of 3, followed by a translation 1 unit up of the graph of $f(x) = x^2$.

106. Let the graph of g be a translation 5 units down, followed by a reflection in the y-axis of the graph of $f(x) = \log x$.

107. Let the graph of g be a vertical stretch by a factor of 4, followed by a translation 3 units left of the graph of $f(x) = e^x$

Simplify the following rational expressions.

108. $\frac{27}{27x+18}$	109. $\frac{4x^2}{6x^2 - 8x}$
110. $\frac{3x+3}{(x+1)(x+3)}$	111. $\frac{x^2+6x+9}{x^3+27}$
112. $\frac{9x^2+81x}{x^3+8x^2-9x}$	113. $\frac{x^2+3x-28}{x^2-49}$

Add or subtract the following rational expressions and simplify.

114. $\frac{7}{2x^2} + \frac{2}{5x}$	115. $\frac{x^2-3}{x^2+x-12} - \frac{2}{x+4}$
116. $\frac{4x}{9(x+2)} - \frac{x+1}{3x}$	117. $\frac{x+1}{x^2-x-2} + \frac{3x}{x^2-3x+2}$

Multiply or divide the following rational expressions and simplify.

118. $\frac{12x^2y}{xy^3} \cdot \frac{x^2y}{24x}$	119. $\frac{6x^2 - x - 12}{x^2 + x} \div \frac{2x^2 - x - 3}{x^2}$
120. $\frac{x^2 - x}{x + 6} \cdot \frac{2x^2 + 11x - 6}{5x}$	121. $\frac{x^2 + 6x + 8}{x + 2} \div (x^2 - 16)$

Solve the following equations.

122. $\frac{2}{3} = \frac{x-1}{x+6}$	123. $6 - \frac{1}{x+1} = \frac{2}{x+1}$
124. $1 = \frac{1}{x^2 + 2x} + \frac{x-1}{x}$	125. $\frac{x+5}{x^2 + x} = \frac{1}{x^2 + x} - \frac{x-6}{x+1}$

Evaluate the following logarithmic expressions.

126. $\log_2 32$	127. $6^{\log_5 5}$	128. $\log_2 \frac{1}{4}$
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Simplify the following logarithmic expressions.

129. $\log 10^{6x}$	130. $3\log_2 32$	131. $e^{\ln(x^2)}$
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Expand or condense the logarithmic expression.

132. $\log 10x^4y$	133. $\ln \frac{5y}{x^3}$
134. $2\log_7 3 + \log_7 5$	135. $\log_2 11 - 2\log_2 x$

Solve the equation. Check for extraneous.

136. $\log_2 (2x-3) = \log_2 7$	137. $\log_4 (x^2 + 2x + 1) = 2$
138. $6^{x+4} = 36^{x-5}$	139. $\log_2 x^3 + \log_2 2 = 4$

Convert the degree measure to radians and the radian measure to degrees in simplest form.

140. -75°

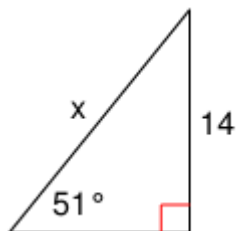
141. $\frac{\pi}{5}$

142. 18°

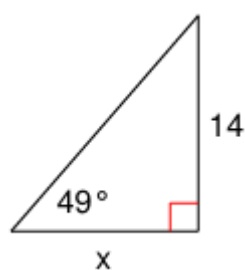
143. $\frac{\pi}{6}$

Use your knowledge of sine, cosine and tangent to solve. Round each side or angle to the nearest tenth.

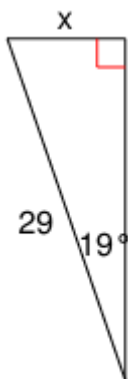
144.



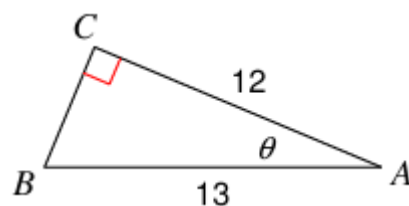
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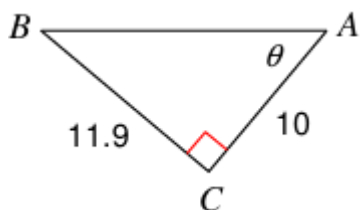
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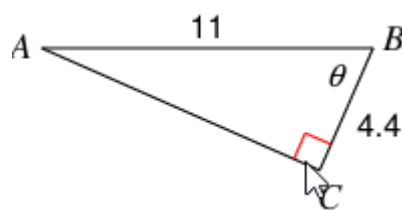
147.



148.



149.



Algebraic Errors to Avoid

Error	Correct form	Comments
$a - (x - b) \neq a - x - b$	$a - (x - b) = a - x + b$	Change all signs when distributing a negative through parentheses
$(a + b)^2 \neq a^2 + b^2$	$(a + b)^2 = a^2 + 2ab + b^2$	Don't forget the middle term when squaring binomials
$\left(\frac{1}{2}a\right)\left(\frac{1}{2}b\right) \neq \frac{1}{2}ab$	$\left(\frac{1}{2}a\right)\left(\frac{1}{2}b\right) = \frac{1}{4}ab$	$\frac{1}{2}$ occurs twice as a denominator
$\frac{a}{x+b} \neq \frac{a}{x} + \frac{a}{b}$	Leave as $\frac{a}{x+b}$	Don't add denominators when adding fractions
$\frac{x}{b} \neq \frac{bx}{a}$	$\frac{x}{b} = \left(\frac{x}{a}\right)\left(\frac{1}{b}\right) = \frac{x}{ab}$	Multiply by the reciprocal of the denominator
$\frac{1}{3x} \neq \frac{1}{3}x$	$\frac{1}{3x} = \frac{1}{3} \cdot \frac{1}{x}$	Use the definition for multiplying fractions
$1/x + 2 \neq \frac{1}{x+2}$	$1/x + 2 = \frac{1}{x} + 2$	Be careful when using a slash to denote division
$(x^2)^3 \neq x^5$	$(x^2)^3 = x^{2 \cdot 3} = x^6$	Multiply exponents when an exponential form is raised to a power
$2x^3 \neq (2x)^3$	$2x^3 = 2(x)^3$	Exponents have priority over coefficients
$\frac{1}{x^2 + x^3} \neq x^{-2} + x^{-3}$	Leave as $\frac{1}{x^2 + x^3}$	Don't shift term-by-term from denominator to numerator
$\sqrt{5x} \neq 5\sqrt{x}$	$\sqrt{5x} = \sqrt{5} \cdot \sqrt{x}$	Radicals apply to every factor inside the radical sign
$\sqrt{x^2 + a^2} \neq x + a$	Leave as $\sqrt{x^2 + a^2}$	Don't apply radicals term-by-term
$\frac{a+bx}{a} \neq 1+bx$	$\frac{a+bx}{a} = 1 + \frac{b}{a}x$	Cancel common factor <i>not</i> common terms
$\frac{a+ax}{a} \neq a+x$	$\frac{a+ax}{a} = 1+x$	Factor <i>before</i> canceling