Algebra 2 & Trigonometry
Final Exam Review 2012-13

Name Key
Date _____ Block ____

This review should be used as a guide only when preparing to sit for the Algebra 2 Trigonometry Final Exam as it represents the topics which will be tested. It is not, however, comprehensive. Notes and work completed throughout the course should also be reviewed and studied.

Define and give one example of each:

1. commutative property
2. associative property
3. distributive property
4. identity property
5. inverse property
6. integer
7. whole number
8. rational number
9. irrational number
10. domain
11. range
12. relation
13. function
14. horizontal line
15. vertical line
16. slopes of parallel lines
17. slopes of perpendicular lines
18. slope-intercept form of a line
19. point-slope form of a line
20. x-intercept of a line
21. y-intercept of a line
22. the ten function families: name, function, shape of graph & domain and range of each

Complete the following:

23. Evaluate: $6 - 3[2 \bullet 3 \div (18 - 20) + 6] =$ -3

24. Evaluate: $(z - y)^3 + 2z^2$ if $y = -3$ and $z = -5$ = -58

25. Name all the sets of numbers to which each of the following belong:

a) -16 Z, Q, R b) 4 N, W, Z, Q, R

c) 0 W, Z, Q, R d) $\sqrt[5]{8}$ I, R

e) $\frac{3}{4}$ Q, R f) 7i i (imaginary/complex)

26. Solve: $16 = 3 + \frac{2}{5}x$ $x = \frac{65}{2}$ or 32.5

27. Solve: $3|2x - 1| + 4 = 19$ $x = -3,\ x = 2$

28. Solve: $3(2x - 8) = -5(x + 4)$ $x = \frac{4}{11}$

29. Solve: $-2|3x + 2| - 8 > -30$ $-\frac{13}{3} < x < 3$

30. Solve: $6x + 1 < 19$ and $-3x + 2 < 11$ all real numbers

31. The graph of $y = x^2 - 3$ is the graph of $y = x^2$ shifted 3 units down.

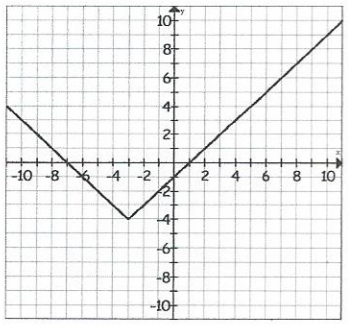
32. The graph of $y = |x + 5|$ is the graph of $y = |x|$ shifted 5 units left.

33. Solve: $3x + 2y = 3$
$4x - 3y = -13$ (-1, 3)

34. Solve: $2x + 3y - z = 6$
$x + 2y - 3z = 7$
$3x - y + 2z = -11$ (-2, 3, -1)

35. A student answered a total of twenty multiple choice and short answer questions on a quiz. Each multiple choice question was worth 3 points and each short answer question was worth 5 points. The students scored 84 points on the quiz. How many of each type of question did the student answer? 8 multiple choice ?'s and 12 short answers ?'s

36. a. Write the equation for the graph below.



vertex: (-3, -4) (h, k)
a = 1

$y = |x + 3| - 4$

Key

37. State the **a.** domain, **b.** range, **c.** type of function (function family), **d.** x-intercept, and **e.** y-intercept for the graph in #36.

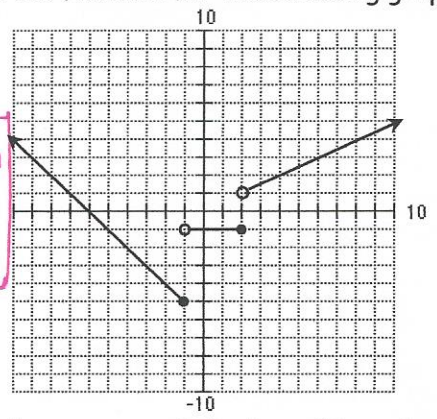
a. $(-\infty, \infty)$ b. $[-4, \infty)$ c. absolute value function d. $x = -7$ and $x = 1$ e. $y = -1$ $(0, -1)$

38. **a.** Graph: $f(x) = \begin{cases} x+3, & x \le -2 \\ 3, & -2 < x < 1 \\ x-4, & x \ge 1 \end{cases}$

b. Evaluate f(-7), f(8) and f(-1).

$f(-7) = -4$, $f(8) = 4$, $f(-1) = 3$

39. Write the function for the following graph.

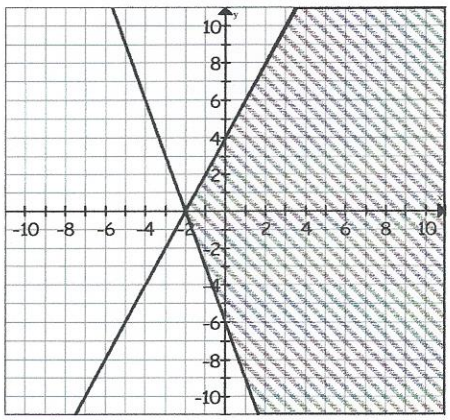


$f(x) = \begin{cases} -x-6, & x \le -1 \\ -1, & -1 < x \le 2 \\ \frac{1}{2}x, & x > 2 \end{cases}$

40. Find the equation of the line of best fit for the given data.

x	1	2	3	4	5
y	4.2	3.8	3.5	2.7	2.2

41. Write a system of inequalities for the graph below.

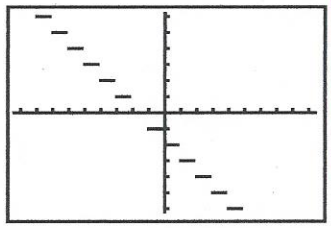


$y \ge -3x - 6$
$y \le 2x + 4$

42. Graph the system of inequalities.

$x + y \le 6$
$x - y \ge -3$

43. Write the equation of the graph below.



$y = [x+2]$ or $y = [x] - 2$

44. Factor completely: $-6x^3y^2 + 10xy^5$

$-2xy^2(3x^2 + 5y^3)$

45. Factor completely: $3x^2 - x - 2$

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

46. Graph. $f(x) = -3x^2 + 5$

47. Graph. $f(x) = \frac{1}{2}(x-5)^2$

48. Simplify: $(a^4b^{-9})(a^3b^7) = a^7b^{-2} = \frac{a^7}{b^2}$

49. Simplify: $\frac{y^5z^7}{y^9z^2} = \frac{z^5}{y^4}$

50. Simplify: $(4m^{-3}n^5p^2q^0)^{-2} = \frac{m^6}{16n^{10}p^4}$

51. Simplify: $5^{-3} = \frac{1}{125}$

52. Simplify: $\frac{(3x^2y)^{-2}x^4y^3}{2x^3y^{-5}} = \frac{y^6}{18x^3}$

53. Simplify: $(3+2\sqrt{5})(6-3\sqrt{5})$

$-12 + 3\sqrt{5}$

54. Simplify: $4\sqrt{18} + 3\sqrt{24} - 2\sqrt{50} + 6\sqrt{8}$

$14\sqrt{2} + 6\sqrt{6}$

55. Simplify: $(3 + 2i) - (4 + 7i)$

$-1 - 5i$

56. Simplify: $(2 - 5i)(3 + 9i)$

$51 + 3i$

57. Solve: $5x^2 + 40 = 0$

$x = \pm 2i\sqrt{2}$

58. Evaluate f(-3): $f(x) = \frac{x^2+2x-5}{3x+1}$

$f(-3) = \frac{1}{4}$

59. Determine the inverse of $f(x) = 3x + 5$.

$y^{-1} = f^{-1}(x) = \frac{1}{3}x + \frac{5}{3}$

60. What is g(-3) if $g(x) = x^3 + 3x - 5$?

$g(-3) = -41$

61. If $f(x) = x^2 - 1$ and $g(x) = x + 3$, what is g(f(2))?

$g(f(2)) = 6$

62. What is the inverse equation of $f(x) = (x-3)^2 + 4$?

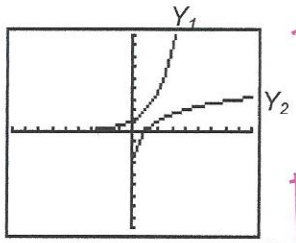
$y = \pm\sqrt{x-4} + 3$

Key

63. Given $f(x) = 2x - 3$ and $g(x) = 2x^2 + 1$, find $f(g(x))$.

$f(g(x)) = 4x^2 - 1$

64. Are Y_1 & Y_2 inverse functions? Explain your answer.

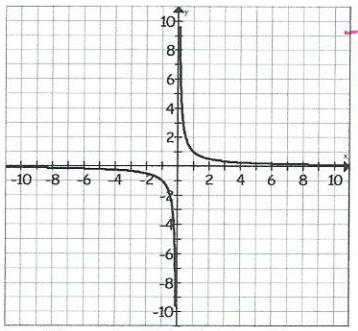


yes

$g(x) - f(x) = 3x^2 + 3x - 12$

65. Find $g(x) - f(x)$ given that $f(x) = 2x^2 - 3x + 5$ and $g(x) = 5x^2 - 7$.

66. What type of function (function family) is shown below?



reciprocal function

67. Find $f(g(x))$ and $g(f(x))$ for $f(x) = x^2 + 2x$; $g(x) = x - 9$

$g(f(x)) = x^2 + 2x - 9$

$f(g(x)) = x^2 - 16x + 63$

68. Solve: $x^4 - 12x - 85 = 0$

$x = -2.69,\ x = 3.34$

69. Solve: $2x^2 + 9x = 5$

$x = -5,\ x = \frac{1}{2}$

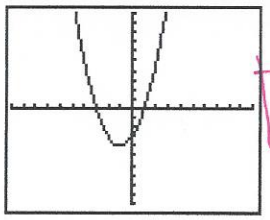
70. Solve: $x^3 = 27$

$x = 3,\ x = \frac{-6 \pm 3i\sqrt{2}}{2}$

71. Solve: $x^2 = 16$

$x = \pm 4$

72. State the roots of the function below.



$x = -3$
$x = 1$

73. If $f(x) = x^2 - 2$ and $g(x) = x + 4$, what is $g(f(6))$?

$g(f(6)) = 38$

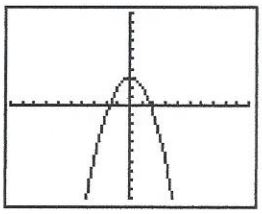
74. State the vertex of: $f(x) = (x + 6)^2 - 8$.

$(-6, -8)$

75. State the vertex of: $f(x) = x^2 + 2x - 1$.

$(-1, -2)$

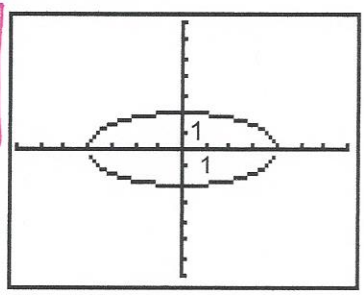
76. Which of the equations below is shown by the graph?



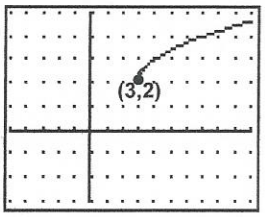
a. $y = x^2 + 3$
b. $y = -x^2 + 3$
c. $y = -(x - 3)^2$
d. $y = (x - 3)^2$

77. What is the domain and range of the graph shown below?

D: [-4, 4]
R: [-2, 2]

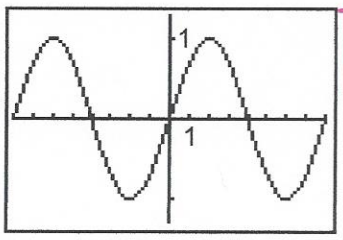


78. Which equation best matches the graph?



a. $f(x) = \sqrt{x+2} + 3$
b. $f(x) = \sqrt{x-2} + 3$
c. $f(x) = \sqrt{x+3} + 2$
d. $f(x) = \sqrt{x-3} + 2$

79. What is the domain and range for the function shown?



D: $(-\infty, \infty)$
R: $[-1, 1]$

80. Find the roots of
$f(x) = x^4 - 2x^3 - 4x^2 + 23x - 30$
over the set of complex numbers.

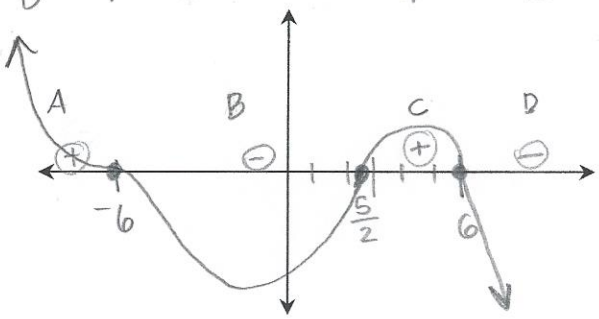
81. Fill in the blanks for $f(x) = -(x^2 - 36)(2x - 5)(x + 6)^2$ and draw a sketch of its graph.

first term: $-2x^5$

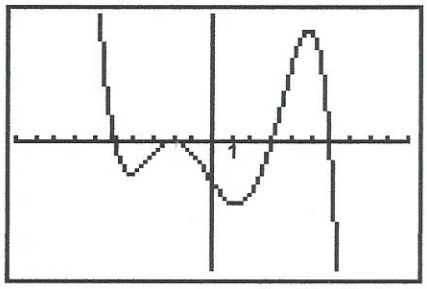
degree:	5	as $x \to -\infty$:	$f(x) \to \infty$
even or odd:	odd		
max turns:	4	as $x \to \infty$:	$f(x) \to -\infty$
max x-int:	5		
zeros at:	$-6, -6, -6, \frac{5}{2}, 6$		
tangent at:	n/a		
terrace at:	@ -6		

sign change chart

test points	$-(x+6)^3$	$(x-6)$	$(2x-5)$	$f(x)$
A -7	+	−	−	+
B 0	−	−	−	−
C 4	−	−	+	+
D 7	−	+	+	−



82. Which could be the function for the following graph?



a. $f(x) = -(x - 3)(x + 2)^3(x + 5)(x - 6)$
b. $f(x) = (x - 3)(x + 2)^3(x + 5)(x - 6)$
c. $f(x) = -(x - 3)(x + 2)^2(x + 5)(x - 6)$
d. $f(x) = (x - 3)(x + 2)^2(x + 5)(x - 6)$

Key

83. For the following equations, determine whether each equation is a logarithmic function, a rational function, an exponential function, a trigonometric function, or a quadratic function.

a) $y = x^2 + 1$ quadratic

b) $y = \log_2 x$ logarithmic

c) $y = \frac{3x}{x-1}$ rational

d) $y = 2^x$ exponential

e) $y = \cos x$ trigonometric

84. State the term that describes the following definitions:

a) A rational equation of the form $y = kx$.
direct variation

b) A rational equation of the form $y = \frac{k}{x}$.
inverse variation

c) A rational equation of the form $z = kxy$.
joint variation

d) A line that a curve approaches as you move away from the origin. asymptote

e) Point(s) where a curve crosses the x-axis.
x-intercepts

85. In the polynomial $x^4 - 2x^3 + 3x^2 + x - 5$, state the linear term, the quadratic term, the cubic. term, and the constant term.

linear term: x quadratic term: $3x^2$
cubic term: $-2x^3$ constant term: -5

86. Solve : $x^4 - 12x - 85 = 0$

See #68

Solution(s): _____

87. Solve: $2x^2 + 9x = 5$

See #69

Solution(s): _____

88. Solve: $x^3 = 27$

See #70

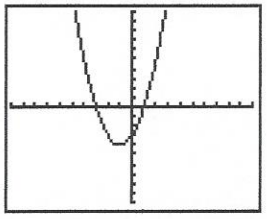
Solution(s): _____

89. Solve: $x^2 = 16$

See #71

Solution(s): _____

90. State the roots of the function below:



See #72

Roots: $x = -2, x = 1$

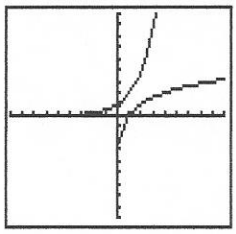
91. Given $f(x) = x^2 + 2$,

a) Find $f(2)$

b) Find $f^{-1}(x)$

c) What is the equation of the line over which inverses are reflections of one another? $y = x$

92. Are the functions below inverses? Why or why not?



yes... They are reflections across the line $y = x$.

Key

93. If $f(x) = x^2 - 2$ and $g(x) = x + 4$, what is $g(f(6))$?

see #73

94. Simplify: $\frac{(x^2)^2}{y^2} \cdot \frac{5}{3x} = \frac{5x^4}{3xy^2} = \boxed{\frac{5x^3}{3y^2}}$

95. Simplify: $\frac{x^3+y^3}{x^2-y^2} \div \frac{y+x}{y-x}$

$\frac{x^3+y^3}{(x+y)(x-y)} \cdot \frac{-(x-y)}{(x+y)} = \boxed{\frac{-(x^3+y^3)}{(x+y)^2}}$

96. Simplify: $\frac{x}{x^2+3x+2} + \frac{3}{4x+4}$

$(x+1)(x+2)$ $\quad 4(x+1)$

$= \frac{4x+3(x+2)}{4(x+1)(x+2)} = \boxed{\frac{7x+6}{4(x+1)(x+2)}}$

97. Simplify: $x + 4 + \frac{1}{x-4} = \frac{(x+4)(x-4)+1}{(x-4)}$

$= \frac{x^2-16+1}{x-4} = \boxed{\frac{x^2-15}{x-4}}$

98. Simplify: $\frac{6n}{n^2-1} - \frac{3}{n+1}$

$(n+1)(n-1)$

$= \frac{6n-3(n-1)}{(n+1)(n-1)} = \frac{6n-3n+3}{(n+1)(n-1)} = \frac{3(n+1)}{(n+1)(n-1)} = \boxed{\frac{3}{n-1}}$

99. Simplify: $\frac{1-\frac{3}{a}}{1-\frac{2}{a}-\frac{3}{a^2}} = \boxed{\frac{a}{a+1}}$

100. Solve: $\left(\frac{9}{10} + \frac{2}{x+1} = \frac{2}{5}\right)$ $\quad 10(x+1)$

$9(x+1) + 20 = 2(x+1)$

$9x+9+20 = 2x+2$

$7x = -27$

$x = -\frac{27}{7}$ $\quad \boxed{x = -5}$

101. Solve: $\left(\frac{x}{x+2} + x = \frac{5x+8}{x+2}\right)$ $\quad (x+2)$

$(x-4)(x+2) = 0$

$x + x(x+2) = 5x+8$

$x^2 + 3x = 5x+8$

$x^2 - 2x - 8 = 0$

$\boxed{x=4 \quad x=-2}$

102. Find the equation of the parabola with a vertex at the point(2, 3) and that passes through the points (1, 5) and (4, 11).

$\boxed{y = 2x^2 - 8x + 11}$

103. State the vertex of: $f(x) = (x + 6)^2 - 8$.

vertex: $(-6, -8)$

104. State the vertex of : $f(x) = x^2 + 2x - 1$.

see #75

vertex: _____

105. What is the effect on the graph of the equation $y = 4x^2$ when the equation is changed to $y = 3x^2$?

The graph is compressed/less wide ...

106. The table shows the grades earned by students on a history test. Calculate the standard deviation of the test scores.

$\sigma = 10.18$

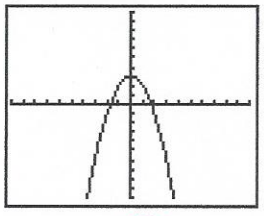
72	75	94	64	75
88	89	63	90	78
89	84	83	97	100
78	84	89	95	93

107. What is the value of $\sum_{n=0}^{3} 2^{n+1}$?

$2^1 + 2^2 + 2^3 + 2^4$

$2 + 4 + 8 + 16 = \boxed{20}$

108. Which of the equations below is shown by the graph?



a.) $y = x^2 + 3$ $\quad$ b.) $y = -x^2 + 3$

c.) $y = -(x-3)^2$ $\quad$ d.) $y = (x-3)^2$

Key

109. State the function family name for each of the following functions:

a.) $f(x) = 2[x - 3]$ greatest integer

b.) $f(x) = -3|x + 7| - 1$ absolute value

c.) $f(x) = 3x^2 + 5$ square

d.) $f(x) = 2(3)^{x-1}$ exponential

e.) $f(x) = \frac{5}{x-3} + 1$ reciprocal

110. What is the maximum point of the graph of the equation $y = -2x^2 + 16x + 5$?

(4, 37)

111. Find the next term in the geometric sequence

$8, 6, \frac{9}{2}, \frac{27}{8}, \ldots$ $r = \frac{6}{8} = \frac{3}{4}$

$\frac{27}{8} \cdot \frac{3}{4} = \frac{81}{32}$

112. Find the solution of the system: $x^2 + y^2 = 25$

$9y = 4x^2$

see attached work

$y = -6.25$

$y = 4$

(-3.75, -6.25)

(3.75, -6.25)

(3, 4)

(-3, 4)

113. Suppose y varies inversely as x. If x = 9 when y = 5. Find y when x = -3.

$y = \frac{k}{x}$ $y = \frac{45}{x}$

$5 = \frac{k}{9}$ $y = \frac{45}{-3}$ $y = -15$

$k = 45$

114. Suppose y varies directly as x. If y = 15 when x = 3. Find y when x = 11.

$y = kx$ $y = 5x$

$15 = k(3)$ $y = 5(11)$

$k = 5$ $y = 55$

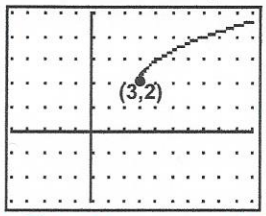
115. Suppose y varies jointly as x and z. If z = 34 when x = 17 and y = 2, find z when x = 4 and y = 8.

$z = kxy$ $z = xy$

$34 = k(17)(2)$ $z = 4 \cdot 8$

$k = 1$ $z = 32$

116. What is the domain and range of the function shown?



domain: $x \geq 3$ or $[3, \infty)$ range: $y \geq 2$ or $[2, \infty)$

117. Solve: $4^{7x+2} = 16^{2x-1}$

$(2)^{2(7x+2)} = (2)^{4(2x-1)}$

$14x + 4 = 8x - 4$

$6x = -8$

$x = \frac{-4}{3}$

118. Solve: $\left(\frac{1}{3}\right)^x = 3^{x+2}$

$(3^{-1})^x = 3^{x+2}$

$-x = x + 2$

$-2x + 2$

$x = -1$

119. Evaluate: $\log_{25} 5$

$25^? = 5$ $\left(\sqrt{25} = 25^{\frac{1}{2}}\right)$

$\frac{1}{2}$

120. Solve: $\log_x 16 = 2$

$x^2 = 16$

$x = 4$

121. Solve: $\log (x^2 + 4x) = \log 21$

$x^2+4x = 21$
$x^2+4x-21 = 0$
$(x+7)(x-3) = 0$
$x = -7$, $x = 3$

122. Find an approximate value for x: $\log 4.1 = x$

$x = 0.6128$

123. Solve: $\log_7 x = \frac{1}{3}\log_7 64$

$\log_7 x = \log_7 \sqrt[3]{64}$
$x = 4$

124. Solve: $\log_2 (x + 1) + \log_2 (x + 1) = 4$

$\log_2 (x+1)^2 = 4$
$(x+1)^2 = 2^4 \rightarrow (x+1)^2 = 16$
$x+1 = \pm 4$
$x+1=4$, $x=3$; $x+1=-4$, $x=-5$ (not)

125. Find an approximate value for x: $\log x = 7.2$

$10^{7.2} = x$
$x = 15848931.92$

126. Solve: $2^{x+1} = 7^x$

$\log 2^{x+1} = \log 7^x$
$(x+1)\log 2 = x \log 7$
$x\log 2 + \log 2 = x \log 7$
$x\log 2 - x\log 7 = -\log 2$
$x(\log 2 - \log 7) = -\log 2$
$x = \frac{-\log 2}{\log(\frac{2}{7})}$
$x = 0.5533$

127. Fill in the blank: 97 is the 26 th term of the arithmetic sequence -3, 1, 5, 9, ...

$a_n = a_1 + (n-1)d$ $\quad d = 4$
$97 = -3 + (n-1)4$
$97 = -3 + 4n - 4$
$104 = 4n$
$n = 26$

128. Find the sum of the arithmetic series described:

$\sum_{n=1}^{30} 2n - 1$

$S_n = \frac{n}{2}(a_1 + a_n)$
$= \frac{30}{2}(1+59)$
$S_{30} = 15(60)$
$S_{30} = 900$

$n = 30 - 1 + 1 = 30$
$a_1 = 2(1) - 1 = 1$
$a_{30} = 2(30) - 1 = 59$

129. Use sigma notation to express the series $6 - 12 + 24 - 48 + 96$.

$a_n = a_1 r^{n-1}$
$6(-2)^{n-1}$

$\sum_{k=1}^{5} 6(-2)^{k-1}$

130. Express 200° in radians.

$200^\circ \cdot \frac{\pi}{180^\circ} = \frac{10\pi}{9}$

131. Express $\frac{11\pi}{6}$ in degrees.

$\frac{11\pi}{6} \cdot \frac{180^\circ}{\pi}$ (30°)
330°

132. What is the least positive angle that is coterminal to -500° ?

$-500^\circ + 720^\circ = 220^\circ$

133. What is the value of $\cos\left(\frac{-\pi}{6}\right)$?

QIV (+) ref ∠ $\frac{\pi}{6}$ (30°)
$\frac{\sqrt{3}}{2}$

134. What is the value of csc (-300°) ?

$= \frac{1}{\sin -300^\circ} = \frac{1}{\frac{1}{2}} \sin(-300^\circ + 360^\circ)$ (QI (+), 30°)
2

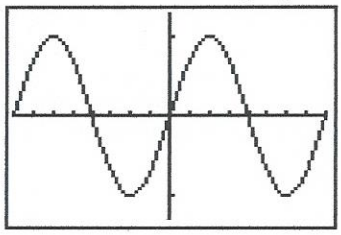
135. What is the value of $\cos^{-1}(-1)$?

$\cos\theta = -1$
180°

136. Find the length of the longest side of a triangle with ∠A = 30°, ∠B = 70° and a = 5.

$\frac{\sin 30^\circ}{5} = \frac{\sin 70^\circ}{b}$
$b = \frac{5\sin 70^\circ}{\sin 30^\circ}$
$b = 9.4$

137. Which function is graphed below?



$y = \sin x$

138. For the following functions, determine whether each function is a trigonometric function, an inverse trigonometric function, or a reciprocal trigonometric function.

a) y = arcsin x inverse trig. function
b) y = sin x trig. function
c) y = csc x reciprocal trig. function

139. Find the roots of $f(x) = x^4 - 2x^3 - 4x^2 + 23x - 30$ over the set of complex numbers.

4 total
2 real
2 imag.

	1	-2	-4	23	-30	
-3		-3	15	-33	30	(x⁴)
	1	-5	11	-10	0	
2		2	-6	10		(x³)
	1	-3	5	0		(x²)

$x = -3, x = 2$ and $x^2 - 3x + 5$

$x^2 - 3x + 5 = 0$
$x = \frac{3 \pm \sqrt{9 - 4(1)(5)}}{2(-3)} = \frac{3 \pm \sqrt{-11}}{-6}$
$x = \frac{-3 \pm i\sqrt{11}}{6}$

(23) $6 - 3[2.3 \div (18-20)+6]$

$6 - 3[6 \div (-2)+6]$

$6 - 3(-3+6)$

$6 - 3(3)$

$6 - 9 = \boxed{-3}$

(24) $(z-y)^3 + 2z^2 \rightarrow y=-3, z=-5$

$(-5-(-3))^3 + 2(-5)^2$

$(-5+3)^3 + 2(25)$

$(-2)^3 - 50$

$-8-50 = \boxed{-58}$

(26) $16 = 3 + \frac{2}{5}x$

$13 = \frac{2}{5}x$

$\frac{5}{2} \cdot 13 = x$

$\boxed{x = \frac{65}{2}}$

(27) $3|2x+1|+4 = 19$

$3|2x+1| = 15$

$|2x+1| = 5$

$2x+1 = -5 \quad 2x+1 = 5$

$2x = -6 \quad 2x = 4$

$\boxed{x=-3 \quad x=2}$

(28) $3(2x-8) = -5(x+4)$

$6x - 24 = -5x - 20$

$11x = 4$

$\boxed{x = \frac{4}{11}}$

(29) $-2|3x+2|-8 > -30$

$-2|3x+2| > -22$

$|3x+2| < 11$

$-11 < 3x+2 < 11$

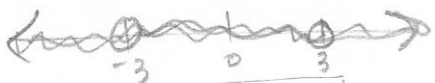
$-13 < 3x < 9$

$\boxed{-\frac{13}{3} < x < 3}$

(30) $6x+1<19$ and $-3x+2<11$

$6x<18 \quad -3x<9$

$x<3$ and $x>-3$



$\boxed{\text{all real numbers}}$

(33) $3(3x+2y=3) \rightarrow 9x+6y=9$

$2(4x-3y=-13) \rightarrow 8x-6y=-26$

$17x = -17$

$x = -1$

$3(-1)+2y=3$

$2y=6$

$y=3$

$\boxed{(-1,3)}$

(35) Let x = mult. choice ?'s, y = short answer ?'s

$x+y=20 \rightarrow y=-x+20$

$3x+5y=84$

$3(-x+20)+5y=84$

$-3x+60+5y=84$

$2y=24$

$y=12$

$x+12=20$

$x=8$

$\boxed{\text{8 mult. choice and 12 short answer}}$

(50) $(4m^{-3}n^5p^2q^0)^{-2}$

$= 4^{-2}m^6n^{-10}p^{-4}q^0$

$$\boxed{\frac{m^6}{16n^{10}p^4}}$$

(51) $5x^2+40=0$

$5(x^2+8)=0$

$x^2+8=0$

$\sqrt{x^2} = \sqrt{-8} = \sqrt{-1\cdot4\cdot2}$

$$\boxed{x = \pm 2i\sqrt{2}}$$

(52) $\dfrac{(3x^2y)^{-2}x^4y^3}{2x^3y^{-5}}$

$\dfrac{(3^{-2}x^{-4}y^{-2})x^4y^3}{2x^3y^{-5}}$

$\dfrac{3^{-2}x^0y}{2x^3y^{-5}}$

$= \dfrac{y\cdot y^5}{2\cdot3^2x^3}$

$= \boxed{\dfrac{y^6}{18x^3}}$

(53) $(3+2\sqrt{5})(6-3\sqrt{5})$

$18 - 9\sqrt{5} + 12\sqrt{5} - \overset{6.5}{30}$

$$\boxed{-12+3\sqrt{5}}$$

(54) $4\sqrt{18} + 3\sqrt{24} - 2\sqrt{50} + 6\sqrt{8}$

$4\sqrt{9\cdot2} + 3\sqrt{4\cdot6} - 2\sqrt{25\cdot2} + 6\sqrt{4\cdot2}$

$4\cdot3\sqrt{2} + 3\cdot2\sqrt{6} - 2\cdot5\sqrt{2} + 6\cdot2\sqrt{2}$

$12\sqrt{2} + 6\sqrt{6} - 10\sqrt{2} + 12\sqrt{2}$

$$\boxed{14\sqrt{2} + 6\sqrt{6}}$$

(56) $(2-5i)(3+9i)$

$6 + 18i - 15i - 45i^2$

$$\boxed{51+3i}$$

(58) $f(x) = \dfrac{x^2+2x-5}{3x+1}$

$f(-3) = \dfrac{(-3)^2+2(-3)-5}{3(-3)+1}$

$= \dfrac{9-6-5}{-9+1}$

$= \dfrac{-2}{-8} = \dfrac{1}{4}$

$$\boxed{f(-3) = \frac{1}{4}}$$

(59) $f(x) = 3x-5$

$y = 3x-5$

$x = 3y-5$

$3y = x+5$

$y = \dfrac{x+5}{3}$

$f^{-1}(x)$ $\boxed{y^{-1} = \frac{1}{3}x + \frac{5}{3}}$

(60) $g(-3)$ for $g(x) = x^3+3x-5$

$g(-3) = (-3)^3 + 3(-3) - 5$

$-27-9-5$

$$\boxed{g(-3) = -41}$$

(61) $f(x)=x^2-1$, $g(x)=x+3$

$f(2)=2^2-1=3$

$f(2)=3$

$g(f(2))=g(3)=3+3$

$g(f(2))=6$

(62) $f(x)=(x-3)^2+4$

$x=(y-3)^2+4$

$\sqrt{x-4}=\sqrt{(y-3)^2}$

$\pm\sqrt{x-4}=y-3$

$\boxed{y=\pm\sqrt{x-4}+3}$

(63) $f(x)=2x-3$, $g(x)=2x^2+1$

$f(g(x))=f(2x^2+1)$

$=2(2x^2+1)-3$

$=4x^2+2-3$

$f(g(x))=4x^2-1$

(67) $f(x)=x^2+2x$, $g(x)=x-9$

$f(g(x))=f(x-9)=(x-9)^2+2(x-9)$

$=x^2-18x+81+2x-18$

$\boxed{f(g(x))=x^2-16x+63}$

$g(f(x))=g(x^2+2x)$

$\boxed{g(f(x))=x^2+2x-9}$

(68) $x^4-12x-85=0$

use calc to find zeros

(69) $2x^2+9x-5=0$

$(2x-1)(x+5)=0$

$x=\frac{1}{2}$, $x=-5$

(70) $x^3=27 \Rightarrow x^3-27=0$

$(x-3)(x^2+3x+9)=0$

$\boxed{x=3}$ $x^2+3x+9=0$

$x=\frac{-3\pm\sqrt{9-4(1)(9)}}{2(1)}$

$x=\frac{-6\pm\sqrt{-27}}{2}$

$\boxed{x=\frac{-6\pm3i\sqrt{3}}{2}}$

(73) $g(f(6))$

$f(x)=x^2-2$, $g(x)=x+4$

$f(6)=6^2-2=34$

$g(f(6))=g(34)$

$g(f(6))=34+4$

$\boxed{g(f(6))=38}$

(74) $f(x)=x^2+2x-1$

$x=\frac{-b}{2a}$ $x=\frac{-2}{2(1)}=-1$

$f(-1)=(-1)^2+2(-1)-1$

$=1-2-1$

$f(-1)=-2$

vertex: $(-1,-2)$

(99) $$\frac{1-\frac{3}{a}}{1-\frac{2}{a}-\frac{3}{a^2}} = \frac{\frac{a-3}{a}}{\frac{a^2-2a-3}{a^2}}$$

$$\frac{(a-3)}{a} \cdot \frac{a^2}{(a-3)(a+1)} = \boxed{\frac{a}{a+1}}$$

(112) $x^2+y^2=25$

$9y = 4x^2 \rightarrow x^2 = \frac{9}{4}y$

$4\left(\frac{9}{4}y + y^2 = 25\right)$

$9y + 4y^2 = 100$

$4y^2 + 9y = 100$

$4y^2 + 9y - 100 = 0$

$y = -6.25$ (calc.)

$y = 4$