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1. Find the distance between the points  $(6, -2)$  and  $(-4, 5)$ .
  2. Find the midpoint of the segment that joins the points  $(5, -1)$  and  $(3, 5)$ .
  3. Find an equation of the circle of radius 5 centered at  $(-2, 3)$ .
  4. Find the center and radius of the circle with equation  $x^2 + (y - 2)^2 = 36$ .
  5. Find the center and radius of the circle with equation  $x^2 + y^2 + 6y + 2 = 0$ .
  6. Find an equation of the line with slope 7 that passes through  $(4, -1)$ .
  7. Find an equation of the line that passes through  $(6, 2)$  and  $(-4, 3)$ .
  8. Find an equation of the line that passes through  $(3, -1)$  that is parallel to  $y = 6x + 1$ .
  9. Find an equation of the line that passes through  $(1, 1)$  that is perpendicular to  $2x + y = 4$ .
  10. Find all real and complex solutions to  $x^2 + 14x = 32$ .
  11. Find all real and complex solutions to  $2x^2 + 6x - 5 = 0$ .
  12. Find all real and complex solutions to  $3x^2 - 2x + 1 = 0$ .

13. Find all real solutions to  $\frac{6}{x^2-1} - \frac{3}{2} = \frac{3}{x-1}$ .

14. Find all real solutions to  $\frac{2}{x+3} + \frac{3}{8} = \frac{5}{4x+12}$ .

15. Find all real solutions to  $x^6 - 2x^3 - 3 = 0$ .

16. Find all real solutions to  $x^{3/2} - 10x^{1/2} + 25x^{-1/2} = 0$ .

17. Find all real solutions to  $x^2\sqrt{x+3} = (x+3)^{3/2}$ .

18. Find all real solutions to  $x^5 - x^3 - 2x = 0$ .

19. Solve the inequality  $2 - 5x < 7$ .

20. Solve the inequality  $-4 < 2x - 4 \leq -2$ .

21. Solve the equation  $|8 - 3x| = 1$ .

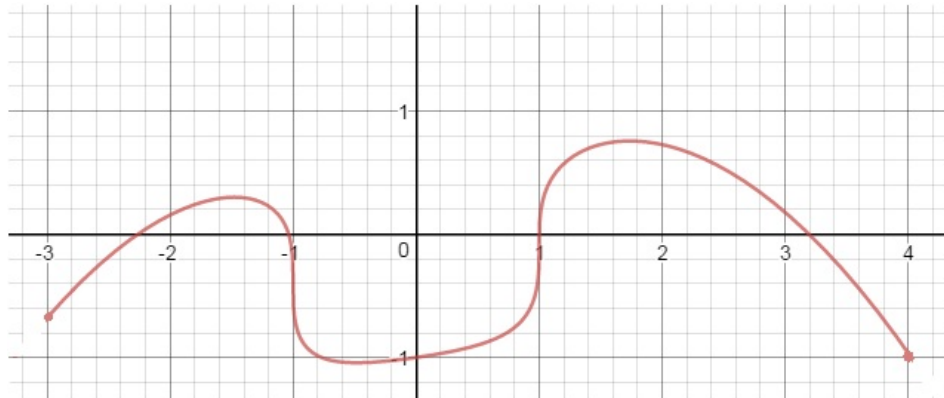
22. Solve the inequality  $|4x + 1| \geq 21$ .

23. Solve the inequality  $x^2 + 5x + 6 > 0$ .

24. Solve the inequality  $2x^2 + x \geq 1$ .

25. Consider the function  $f(x) = x^2 - 4x$ . Evaluate  $f(x - 3)$  and simplify.
26. Find the domain of the function  $f(x) = \sqrt{4 - x^2}$ .
27. Find the domain of the function  $f(x) = \frac{x - 1}{x^2 + 3x - 10}$
28. Find the domain of the function  $f(x) = \frac{5x}{\sqrt{x - 1}}$ .
29. Find the domain of the function  $f(x) = \ln(8 - 2x)$ .
30. Find the domain of the function  $f(x) = \frac{1}{\log_2(x)}$ .
31. If  $f(x) = 3\sqrt{x - 4}$  and  $g(x) = x^2 - 1$ , find the formula for  $(f \circ g)(x)$ .
32. If  $f(x) = 3\sqrt{x - 4}$  and  $g(x) = x^2 - 1$ , find the formula for  $(g \circ f)(x)$ .
33. If  $f(x) = 13x^{5/3} - 1$ , find the formula for  $f^{-1}(x)$ .
34. If  $f(x) = \frac{2x + 1}{3x - 7}$ , find the formula for  $f^{-1}(x)$ .
35. Sketch a graph of the function  $f(x) = \sqrt[3]{x^2 - 1}$  by making a table of values and plotting some points.

Consider the following graph of a function,  $y = f(x)$ .



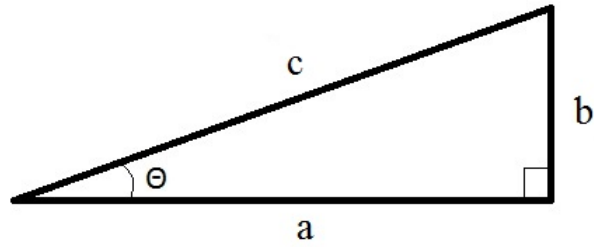
36. Find the domain of  $f$ .
37. Find, approximately, the range of  $f$ .
38. Find, approximately, the intervals where  $f$  is increasing.
39. Find, approximately, the intervals where  $f$  is decreasing.
40. Find, approximately, the intervals on which  $f(x) > 0$ .
41. Find the approximate coordinates of any local maxima of  $f$ .
42. Find the approximate coordinates of any local minima of  $f$ .
43. Is  $f$  a one-to-one function?
44. Sketch the graph of  $y = f(2 - x) + 1$ .

45. Write the standard form of the quadratic function  $f(x) = 2x^2 - 8x + 4$ .
46. Find the coordinates of the vertex of the graph of  $y = x^2 - 5x + 2$ .
47. Find the maximum or minimum value of  $f(x) = 3x^2 - 8x + 4$ .
48. Determine the end behavior of the function  $f(x) = 3x^4 - 4x^3 - 10x - 1$ .
49. Consider the function  $f(x) = x^4 + x^3 - 2x^2$ . Find all real zeros of  $f$ , state their multiplicities, and sketch the graph of  $f$ .
50. Find the quotient and remainder of the division  $\frac{x^4 - 2x^2 + 7x}{x^2 - x + 3}$ .
51. Find the quotient and remainder of the division  $\frac{x^2 - 5x + 4}{x - 3}$ .
52. Let  $f(x) = x^5 - 2x^4 - 9x^3 + 22x^2 + 4x - 24$ . Suppose that you know that 2 is a zero of  $f$  of multiplicity 3. Use this information to completely factor  $f$ .
53. Find a polynomial of degree 3 with integer coefficients and zeros at  $\frac{1}{2}$ ,  $-1$ , and  $2$ .
54. Let  $f(x) = \frac{1}{(x+2)^2}$ . Find all zeros of  $f$ , vertical asymptotes of  $f$ , and horizontal asymptotes of  $f$ . Find the behavior of the graph near the vertical asymptotes, and use this to sketch a graph of  $f$ .
55. Let  $f(x) = \frac{x^2 - 1}{x^2 - 2x - 8}$ . Find all zeros of  $f$ , vertical asymptotes of  $f$ , and horizontal asymptotes of  $f$ . Find the behavior of the graph near the vertical asymptotes, and use this to sketch a graph of  $f$ .
56. Solve the inequality  $\frac{x^2 - 9}{x^3 + x^2 - 4x - 4} > 0$ .

57. Let  $f(x) = 4e^{4-x}$ . Use a calculator to find  $f(-1)$ , rounded to three decimal places.
58. Write the equation  $\log_6(36) = 2$  in exponential form.
59. Write the equation  $4^x = 20$  in logarithmic form.
60. Let  $f(x) = 7\log_3(x + 2)$ . Use the change of base formula and a calculator to find  $f(2)$ , rounded to three decimal places.
61. Use the log laws to expand  $\log_3\left(\frac{(x + 4)\sqrt{2x}}{(x + 1)^7}\right)$ .
62. Use the log laws to expand  $\log_{10}\left(\frac{x^2y^4}{\sqrt{x^3 - 6}}\right)$ .
63. Write as a single logarithm using the log laws:  $\ln(4x) - 2\ln(x - 1) - 6\ln(x + 2)$ .
64. Solve the equation  $3^{x-4} = 27$ .
65. Solve the equation  $e^{4x} + 4 = 9$ .
66. Solve the equation  $2^{2x} - 2^x - 12 = 0$ .
67. Solve the equation  $\log_{10}(2x - 3) + 1 = 0$ .
68. Solve the equation  $\log_3(x^2 - 4) + \log_3(x) = \log_3(x - 2)$ .
69. Solve the equation  $\log_8(x + 5) - \log_8(x - 2) = 1$ .

70. Convert the angle  $160^\circ$  to radians.
71. Convert the angle  $\frac{\pi}{18}$  to degrees.
72. Find an angle between 0 and  $2\pi$  that is coterminal to  $-\frac{19\pi}{7}$ .
73. Find the reference angle of  $-\frac{19\pi}{7}$ .
74. If  $\theta$  is an angle such that  $\sin \theta < 0$  and  $\tan \theta > 0$ , in what quadrant must  $\theta$  lie?
75. A circle with a radius 4 has a sector with central angle  $30^\circ$ . Find the area of this sector.
76. A circle with radius 3 has a sector with area  $6\pi$ . Find the length of the arc surrounding this sector.
77. What is the domain of the function  $f(x) = \sin^{-1}(x)$ ?
78. What is the range of the function  $f(x) = \cos^{-1}(x)$ ?
79. What is the range of the function  $f(x) = \tan^{-1}(x)$ ?
80. What is the amplitude of the function  $f(x) = 3 \cos(7x - 2) + 5$ ?
81. What is the period of the function  $f(x) = 3 \cos(7x - 2) + 5$ ?

The following questions are based on a triangle of this form:



82. If  $b = 3$  and  $c = 4$ , find  $a$ .

83. If  $a = 5$  and  $c = 7$ , find  $\tan \theta$ .

84. If  $a = 4$  and  $\theta = 45^\circ$ , find  $c$ .

85. If  $b = 1$  and  $c = 2$ , find the value of  $\theta$ .

86. If  $b = 1$  and  $c = 3$ , find the area of the triangle.



In these problems, you are given three parts of an oblique triangle, where side  $a$  is opposite angle  $A$ , side  $b$  is opposite angle  $B$ , and side  $c$  is opposite angle  $C$ . In each problem, follow the instructions to give the desired information.

87. Suppose that  $A = 30^\circ$ ,  $C = 80^\circ$ , and  $b = 10$ . Find the length of side  $a$ .

88. Suppose that  $A = 40^\circ$ ,  $B = 70^\circ$ , and  $a = 2$ . Find the length of side  $b$ .

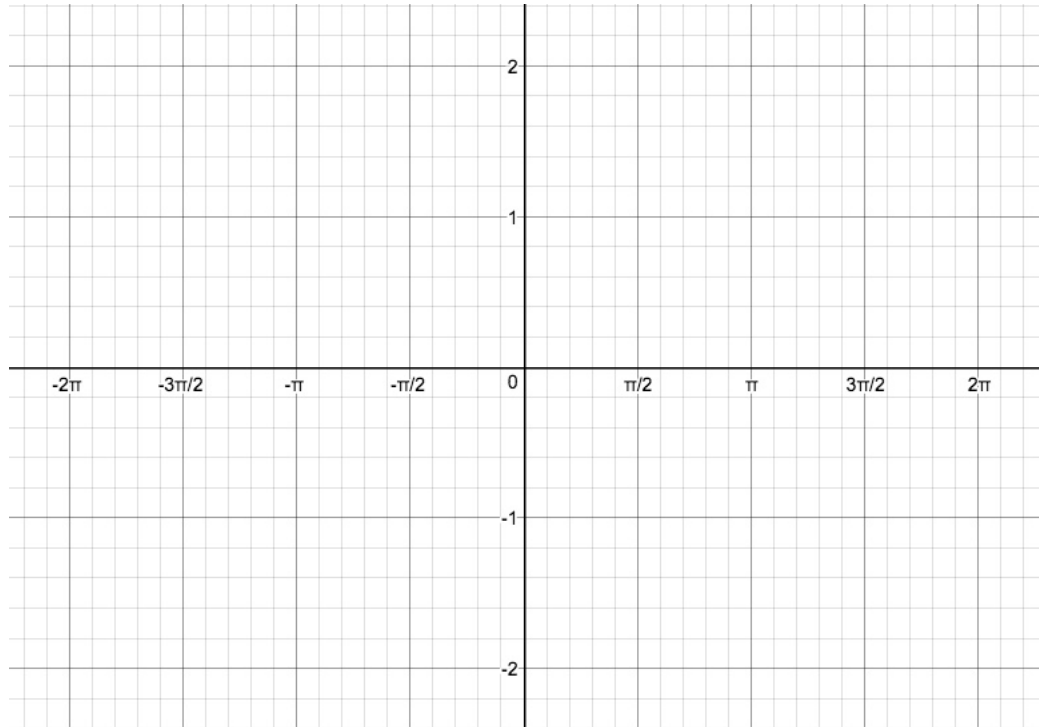
89. Suppose that  $a = 8$ ,  $b = 10$ , and  $c = 12$ . Find the measure of angle  $A$ .

90. Suppose that  $A = 120^\circ$ ,  $b = 8$ ,  $c = 2$ . Find the length of side  $a$ .

91. Suppose that  $A = 35^\circ$ ,  $b = 2$ ,  $c = 7$ . Find the area of the triangle.

92. Suppose that  $A = 25^\circ$ ,  $a = 12$ , and  $c = 23$ . How many possible solutions are there to this triangle?

93. On the grid below, sketch the graph of  $f(x) = \sin(x)$ .



94. Review what the graphs of  $\tan(x)$ ,  $\cot(x)$ ,  $\sec(x)$ , and  $\csc(x)$  look like. (For example, redo the graph-matching problem from Exam 4.)

95. For each of the following, find the exact value of the expression (that is, a rounded answer from your calculator will NOT be good enough).

(a)  $\sin^{-1}(\sin(\frac{2\pi}{3}))$

(b)  $\tan(\tan^{-1}(-4))$

(c)  $\csc(\sin^{-1}(0))$

(d)  $\sin(\tan^{-1}(-1))$

96. Write the expression  $\cos(\tan^{-1}(x))$  as an algebraic expression in terms of  $x$ .

97. Write the expression  $\cot(\sin^{-1}(x))$  as an algebraic expression in terms of  $x$ .

98. Use a half-angle formula to find the exact value of  $\tan(15^\circ)$ . (A rounded answer from your calculator will NOT be good enough.)
99. Use a half-angle formula to find the exact value of  $\cos\left(\frac{\pi}{8}\right)$ . (A rounded answer from your calculator will NOT be good enough.)
100. Verify the identity  $(1 - \tan x)(1 - \cot x) = 2 - \sec x \csc x$ .
101. Verify the identity  $\frac{\sin 2x}{\sin x} - \frac{\cos 2x}{\cos x} = \sec x$ .
102. Verify the identity  $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 2 + 2 \cos(x + y)$ .
103. Find the exact value of  $\tan(\csc^{-1}(4) - \cos^{-1}(\frac{1}{8}))$ .
104. Find the exact value of  $\cos(2 \sin^{-1}(\frac{1}{3}) - \frac{\pi}{4})$ .
105. Write the expression  $\cos(\sin^{-1} x + \cos^{-1} y)$  as an algebraic expression in terms of  $x$  and  $y$ .
106. Write the expression  $\sin(2 \tan^{-1} x)$  as an algebraic expression in terms of  $x$ .
107. Solve the equation  $4 \cos(\theta) = 1$ .
108. Solve the equation  $\tan(\theta) = -6$ .
109. Solve the equation  $\cos(\theta) \tan(\theta) - \cos(\theta) = 0$ .
110. Solve the equation  $3 \sin^2(\theta) + 2 \sin(\theta) = 1$ .

111. To estimate the height of a mountain above a level plain, the angle of elevation to the top of the mountain is measured to be  $32^\circ$ . One thousand feet closer to the mountain along the plain, it is found that the angle of elevation is  $35^\circ$ . Find the height of the mountain, to the nearest foot.
112. A 96-ft tree casts a shadow that is 120 ft long. What is the angle of elevation of the sun?
113. The Leaning Tower of Pisa leans  $5.6^\circ$  from the vertical. A tourist stands 105 m from its base with the tower leaning directly towards her. She measures the angle of elevation to the top of the tower to be  $29.2^\circ$ . Find the length of the tower, to the nearest meter.
114. Find two integers whose sum is 4542 and whose product is 1366632.
115. An apartment has a rectangular bedroom with an area of  $228 \text{ ft}^2$  that is 7 ft longer than it is wide. What is the width of the room?
116. A large box has a volume of  $180 \text{ ft}^3$ . Its length is 9 ft greater than its height, and its width is 4 ft less than its height. What are the dimensions of the box?
117. A ball is thrown into the air, and its height  $h$  after  $t$  seconds is given by  $h(t) = 128 + 16t - 16t^2$ . Find the maximum height achieved by the ball.
118. You invest \$500 into an account with an annual interest rate of 8% that compounds monthly. How much money will be in your account after 2 years?
119. You invest \$800 into an account with an annual interest rate of 10% that compounds continuously. How much money will be in your account after 3 years?
120. You and your friend are each investing \$1000 into bank accounts. Your account has an annual interest rate of 6% and compounds continuously. Your friend's account compounds monthly, but you don't know the interest rate. At the end of 1 year, you end up with the exact same amount of money in your account as your friend has in her account. Find the annual interest rate of your friend's account.