

Prerequisite Material for Math 4 Summer Class

Solve for x:

1. $4(x - 5) - 3(2x - 5) = 6 - 5(2x + 1)$

2. $3(2x - 3) + 4(3 - 2x) = 5(3x - 2) - 2(x + 1)$

3. $|2x + 1| = 9$

4. $|3x - 2| = 10$

5. $(x - 4)(x + 4) = 4x$

6. $(x - 2)(x + 3) = 6$

7. $x^2 + 10x = -21$

8. $x^2 - 6x = 43$

9. $2x^2 - 4x + 3 = 0$

10. $8x^2 + 2x + 1 = 0$

11. $\frac{10x}{x-7} = \frac{7}{x^2-7x} + \frac{1}{x}$

12. $\frac{x}{x+6} + \frac{5}{x} = \frac{36}{x^2+6x}$

13. $\sqrt{x-2} = 2-x$

14. $\sqrt{25-4x} = 5 - \sqrt{x}$

15. $x^{1/2} + 3x^{1/4} + 2 = 0$

16. $x^{-2} + 9x^{-1} - 10 = 0$

17. $2^x = 1.9$

18. $3^x = 4.6$

19. $\log_2(x+3) + \log_2(x-3) = 4$

20. $\ln x = -1$

Solve for x and express your answer in interval and set-builder notation:

21. $6(x - 3) - 5x > 5(8 - x) + 2$

22. $3(x + 1) + 5(x - 4) \leq 2(x - 2) - 5(2x + 1)$

23. $-3 < x + 2 < 7$

24. $5 < 2x + 1 < 15$

25. $|3x + 1| < 4$

26. $|2x + 4| \geq 8$

27. $2x^2 + 9x + 4 \geq 0$

28. $x^2 < 4x$

Solve:

29. $V_0 = \frac{VA}{1+BA}$ for A

30. $\frac{1}{a} + \frac{1}{b} = \frac{1}{c}$ for b

Solve the following systems for (x, y):

31. $2x - 3y = 2$
 $5x + 4y = 51$

32. $4x - 24 = 3y$
 $9y = 3x - 1$

Solve the following systems for (x, y, z):

33. $2x - y + 2z = 11$
 $3x + 4y - 2z = -4$
 $x + 2y + 3z = 9$

34. $2x + y + z = 1$
 $x + y + z = -1$
 $4x + y + 3z = 3$

Solve the following systems for (x, y):

35. $4x^2 + 9y^2 = 36$
 $3y + 2x = 6$

36. $x^2 + y^2 = 89$
 $x - y = 3$

Simplify using scientific notation. Express your answer in scientific notation.

37. $(6.5 \times 10^3)(5.2 \times 10^{-8})$

38. $\frac{12.6 \times 10^8}{4.2 \times 10^{-3}}$

Simplify:

39. $8 - 3[-2(5 - 7) - 5(4 - 2)]$

40. $17 - |5 - (-2)| + 12 \div 2 \cdot 3$

41. $(x - y)(x^2 - 4xy + y^2)$

42. $(x - 2)(x^2 + 2x + 4)$

43. $\frac{1}{y+1} + \frac{y}{y^2-1} - \frac{1}{y-1}$

44. $\frac{1}{y+2} + \frac{y}{y^2-4} - \frac{1}{2-y}$

45. $\frac{2y^2 - 7y + 3}{2y + 1} \div \frac{4y^2 - 1}{1 + 2y}$

46. $\frac{x^2 + 2x}{x^2 + 4x + 4} \cdot \frac{6 + x - x^2}{x^2 - 3x}$

47. $\frac{1 - \frac{1}{x}}{1 + \frac{1}{x}}$

48. $\frac{\frac{x^2 - x - 12}{x^2 - 2x - 15}}{\frac{x^2 + 8x + 12}{x^2 - 5x - 14}}$

49. $(12a^2b^2 + 6a^2b - 15ab^2) \div (3ab)$

50. $(40x^4y^3 - 20x^3y^2 - 50x^2y) \div (10x^3y^3)$

51. $(y^3 - 4y^2 + 3y - 6) \div (y - 2)$

52. $(x^3 - x + 6) \div (x + 2)$

Simplify. Answer with positive exponents.

53. $\left(\frac{3s^{-2}t}{12st^2}\right)^{-1}$

54. $(-8x^{-4}y^5z^2)^{-4}$

Simplify. Express your answer in simple radical form.

55. $(-8x^{-5}y^7)^{1/3}$

56. $(2x)^{-1/2}$

57. $\sqrt[5]{a^3b} \sqrt{ab}$

58. $\sqrt{a^4b^3c^4} \sqrt[3]{ab^2c}$

59. $5\sqrt{45x} - 2\sqrt{20x}$

60. $4\sqrt[3]{x^4y^2} + 5x\sqrt[3]{xy^2}$

61. $(4 + \sqrt{x})(5 - 3\sqrt{x})$

62. $\frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}}$

Simplify. Express your answer in a + bi form.

63. $(-9 + 2i) - (-17 - 6i)$

64. $-6i(3 - 5i)$

65. $(-2 + i)(3 - 2i)$

66. $\frac{8 - 2i}{-5 - 3i}$

67. i^{25}

68. i^{39}

Name the slope and y-intercept of:

69. $3x - y - 5 = 0$

70. $7x - 3y + 6 = 0$

71. Find the equation of the line in slope-intercept form that passes through (3, 7) and is parallel to $x + 2y = 6$.

72. Find the equation of the line in standard form that passes through (3, -2) and is perpendicular to $3x + 4y = 5$.

Write a quadratic equation having the following solutions:

73. $\{3i, -3i\}$

74. $\{\frac{-2}{5}, 4\}$

Factor completely:

75. $64y^3 - 27$

76. $12x^4 - 11x^3 - 15x^2$

77. $z^4 - 8z^2 - 9$

78. $x^4 - 81$

If $f(x) = x^2 - 4x + 1$, find:

79. $f(\frac{1}{2})$

80. $f(2 - \sqrt{5})$

If $g(x) = \frac{x^2 - 4}{x + 2}$, find:

81. $g(2)$

82. $g(m - 3)$

If $f(x) = x^2 - 1$ and $g(x) = 3x + 1$, find:

83. $(f \cdot g)(-2)$

84. $(f - g)(3)$

85. $(g \circ f)(x)$

86. $(f \circ g)(x)$

What is the vertex, equation of the axis of symmetry, x-intercepts, the y-intercept, and the maximum or minimum value of:

87. $f(x) = 8 + \frac{1}{2}x^2 - 4x$

88. $f(x) = -15x + 25 + 5x^2$

Find $f^{-1}(x)$ if:

89. $f(x) = 5 - 2x$

90. $f(x) = x^3 - 1$

Find:

91. $\log_2 0.2$

92. $\log_5 42$

Find the midpoint of the line segment with the following endpoints and the distance (to three decimal places accuracy) between:

93. (2,3) and (-5,-4)

94. (-7,-11) and (3,-16)

Find the center and radius of each circle:

95. $x^2 + y^2 + 8x - 6y - 15 = 0$

96. $x^2 + y^2 - 8x - 84 = 0$

By inspection, classify each equation as a line, parabola, circle, ellipse, or hyperbola:

97. $(y - 1) = 3(x + 1)$

98. $y = 5x^2 - 3$

99. $\frac{x^2}{4} + \frac{y^2}{9} = 1$

100. $x^2 - 2y^2 = 10$

101. $x^2 + y^2 = 10$

102. $x^2 - y^2 = 9$

103. $5y^2 - 4 = x$

104. $4x^2 + 3 = 2y^2$

105. $x^2 + 2y^2 = 12$

106. $x^2 - y^2 = -9$

Graph the following;

107. $2x + y = 1$

108. $f(x) = -\frac{2}{5}x + 6$

109. $2x + y > 6$

110. $4x - 5y \geq -20$

111. $2x - y \leq 4$
 $3x + 2y > -6$

112. $y < -2x + 4$
 $y < x - 4$

113. $f(x) = x^2 - 2x - 15$

114. $f(x) = (x - 3)^2 + 2$

115. $9x^2 + 4y^2 = 36$

116. $\frac{x^2}{49} + \frac{y^2}{36} = 1$

117. $(x - 2)^2 + (y - 3)^2 = 16$

118. $(x + 4)^2 + (y + 5)^2 = 36$

119. $f(x) = \log_2(x + 1)$

120. $f(x) = \log_3 x + 1$

121. For a summer sales job, you are choosing between two pay arrangements: a weekly salary of \$200 plus 5% commission on sales, or a straight 15% commission. For how many dollars of sales will the earnings be the same regardless of the pay arrangement?
122. Rent-a-Truck charges a daily rental rate of \$39 plus \$0.16 per mile. A competing agency, Ace Truck Rentals, charges \$25 a day plus \$0.24 per mile for the same truck. How many miles must be driven in a day to make the daily cost of both agencies the same? What will be the cost?
123. If two pads and 19 pens are sold for \$5.40 and 7 of the same pads and 4 of the same pens sell for \$6.40, find the cost of one pad and one pen.
124. A motel with 60 rooms charges \$90 per night for rooms with kitchen facilities and \$80 per night for rooms without kitchen facilities. When all rooms are occupied, the nightly revenue is \$5260. How many rooms of each kind are there?

125. The length of a rectangular carpet is 4 feet greater than twice its width. If the area is 48 square feet, find the carpet's length and width.
126. A baseball is thrown straight up from a height of 64 feet. The function $s(t) = -16t^2 + 48t + 64$ describes the ball's height above the ground, $s(t)$, in feet, t seconds after it was thrown. How long will it take for the ball to hit the ground?
127. A rectangular garden 10 feet wide and 12 feet long is surrounded by a rock border of uniform width. The area of the garden and rock border combined is 168 square feet. What is the width of the rock border?
128. Although there are 2332 students enrolled in the college, this is 12% fewer students than there were last year. How many students were enrolled last year?
129. With a 6% raise, you will earn \$19,610 annually. What is your salary before this raise?
130. A piece of wire measuring 20 feet is attached to a telephone pole as a guy wire. The distance along the ground from the bottom of the pole to the end of the wire is 4 feet greater than the height where the wire is attached to the pole. How far up the pole does the guy wire reach?
131. A tree is supported by a wire anchored in the ground 5 feet from its base. The wire is 1 foot longer than the height that it reaches on the tree. Find the length of the wire.
132. Working alone, you can mow the lawn in 2 hours, and your sister can do it in 3 hours. How long will it take you to do the job if you work together?
133. Zoe, an experienced shipping clerk, can fill a certain order in 5 hours. Willy, a new clerk, needs 9 hours to complete the same job. Working together, how long will it take them to fill the order?
134. Your motorboat can travel 15 miles per hour in still water. Traveling with the river's current, the boat can cover 20 miles in the same time it takes to go 10 miles against the current. Find the rate of the current.
135. The function $F(t) = 1 - k \ln(t + 1)$ models the fraction of people, $F(t)$, who remember all the words in a list of nonsense words t hours after memorizing the list. After 3 hours, only half the people could remember all the words. Determine the value of k and then predict the fraction of people in the group who will remember all the words after 6 hours. Round to three decimal places and then express the fraction with a denominator of 1000.
136. Columbus, Ohio, grew in population from 1970 to 1980 at an annual rate of 0.40%. If the population was 540,025 in 1970, what was the population in 1980, to the nearest ten thousand? (use $A = A_0e^{kt}$)
137. Estimate the population of Columbus in the year 2000, if it continues to grow at the rate described in #136. (Use $A = A_0e^{kt}$)
138. A certain city of population 775,000 is growing at an annual rate of 4%. How long will it take (to the nearest year) for the population to double? (Use $A = A_0e^{kt}$)
139. Repeat #138, finding how long it will take for the population to triple.
140. A rectangle has an area of 20 in^2 and a perimeter of 18 in. Find its dimensions.
141. A rectangle has a diagonal of 5 feet and a perimeter of 14 feet. Find the rectangle's dimensions.