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You may want to practice these problems after you have studied:

Solve by completing the square.

1. $3k^2 + 5k + 2 = 0$

2. $\frac{y^2}{4} - \frac{y}{2} + 1 = 0$

3. $0.6x^2 + 2 = 2.4x$

4. $\frac{1}{y+2} + \frac{1}{y+6} = 1$

Use the discriminant to determine the nature of the roots.

5. $9x^2 + 4 = 2x$

6. $5x^2 - 5x + 4 = 0$

7. $2x^2 + 3x = -3$

8. $0.04x^2 + 0.03 = -0.08x$

Solve using the quadratic formula.

9. $9x^2 + 4 = 2x$

10. $0.04x^2 + 0.03 = -0.08x$

Solve.

11. A walkway of uniform width has an area of 72 square meters and surrounds a swimming pool that is 8 meters wide and 10 meters long. Find the width of the walkway.

Solve the following equations.

12. $2(y^2 - 4)^2 + 5(y^2 - 4) - 3 = 0$

13. $x - 11\sqrt{x} + 30 = 0$

14. $\left(\frac{1+x}{2}\right)^2 - 3\left(\frac{1+x}{2}\right) = 18$

15. $\sqrt{x+6} - 6\sqrt[4]{x+6} + 8 = 0$

Graph using transformations.

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

17. $y = -(x+1)^2 - 5$

Graph using $\frac{-b}{2a}$.

18. $g(x) = \frac{1}{2}x^2 + x + \frac{1}{2}$

19. $f(x) = 2x^2 - 12x + 18$

Write the equation of a parabola.

20. If the vertex is (4,-3) and contains the point (2,-1)

21. If the vertex is (4,2) and one x-intercept is 3

Write an equation with integral coefficients.

22. If the roots are $1+\sqrt{3}, 1-\sqrt{3}$

23. If the roots are $\frac{1-i\sqrt{5}}{4}, \frac{1+i\sqrt{5}}{4}$

Find a quadratic function $f(x)=ax^2+bx+c$ for each parabola.

24. vertex (2,12) and x-intercepts are -4 and 8

25. maximum value is 6 when $x=-2$, one zero is 1

Solve.

26. A rectangular field is to be enclosed by a fence and divided into two parts by another fence. Find the maximum area that can be enclosed and separated in this way with 800 meters of fencing.

27. A ball is thrown vertically upward with an initial speed of 80 ft/sec. Its height after t seconds is given by the equation: $h=80t-16t^2$
a. How high does the ball go?
b. When does the ball hit the ground?

28. A charter company will provide a plane for a fare of $60 each for 20 or fewer passengers. For each passenger in excess of 20, the fare is decreased by $2 per person for everyone. What number of passengers will produce the greatest revenue for the company?

29. If s varies directly as r^2 and $s=12, \text{when } r=2, \text{ find } s \text{ when } r=5.$

30. The stretch in a loaded spring varies directly as the load it supports. A load of 15 kg stretches a certain spring 3.6 cm. What load would stretch the spring 6 cm?

31. The distance an object falls from rest varies directly as the square of the time it has fallen. If the object fell 4 ft during the first half second, how far did it fall during the next two seconds?

32. If s varies directly as r and inversely as t, and s = 10 and r = 5 when t = 3, for what value of t will s = 3 when r = 4?

33. Suppose that z varies jointly as u and v and inversely as w, and that z = 0.8 when u = 8, v =6 and w = 5. Find z when u = 3, v = 10 and w = 5.

34. The heat loss through a glass window varies jointly as the area of the window and the difference between the inside and outside temperatures. If the loss through a window with area 3 m^2 is 720 BTU when the temperature difference is 15° C, what is the heat loss through a window with area 4.5 m^2 when the temperature difference is 12° C?

Divide.

35. $\frac{9u^4+6u^3+4u+4}{3u^2+2u+2}$

36. $(6x^3+x^2+7x+10)\div(3x+2)$

37. Find k so that when x^3+kx^2-kx+1 is divided by $x-2$, the remainder is 0.

For 38 and 39, divide using synthetic division:

38. $\dfrac{2x^4+x^3-x-2}{x+1}$

39. $\dfrac{6t^4+5t^3-10t+4}{3t-2}$

40. **Determine k so that the first polynomial is a factor of the second.** $x+2;\ \ 2x^3+3x^2+k$

41. **Use synthetic substitution to find P(c) for** $P(x)=4x^3-4x^2+5x+1;\ \ c=\dfrac{3}{2}$

42. **Use the factor theorem to determine whether the binomial is a factor of the given polynomial.** $z-i;\ \ P(z)=z^7+z^6+z^5+z^4+z^3+z^2+z+1$

43. **A root is given. Solve the equation.** $t^3-11t+20=0;\ \ -4$

In 44 and 45, all but one of the equation's roots are given. Find the remaining root. Check your answer by substituting it for x in the equation.

44. $x^3-3x^2+4x-12=0;\ \ 3\ \textit{and}\ \ 2i$

45. $x^4-2x^3+4x^2+2x-5=0;\ \ 1,\ -1\ \textit{and}\ 1-2i$

List the possibilities for the nature of the roots of the equation.

46. $x^5-x^3-x-2=0$

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

48. **Find a fourth-degree polynomial with integral coefficients that has the given roots:** *2i; 1-i*

49. **Show that (a) the given number is a root and (b) its conjugate is *not* a root.** $x^3+2x^2+x-1+i=0;\ \ -1+i$

For 50 and 51, list the possible rational roots of each equation.

50. $2x^3-11x^2+16x-6=0$

51. $3x^4+4x^3-x^2+4x-4=0$

Find all roots for the polynomial.

52. $f(x)=2x^3+3x^2+4x+6$

53. $f(x)=3x^4-8x^3+12x^2-40x-15$

Find (a) the distance between each pair of points and (b) the midpoint of the line segment joining the points.

54. (2,2) and $\left(\dfrac{1}{3},-2\right)$

55. $\left(1+\sqrt{5}\right),2+\sqrt{3})$ and $(1-\sqrt{5},-2+\sqrt{3})$

56. **Find an equation of the perpendicular bisector of** $\overline{AB}$, given A (8,-3) and B (-2,5).

Find the equation of the circle:

57. If the radius is $\sqrt{2}$ and center (6,1)

58. center is on the line $y=4$ and tangent to the x-axis at (-2,0)

Find the equation of the parabola described.

59. Focus at (0,2); directrix $x=2$

60. Focus (3,4) and (3,2)

Find the vertex, focus, directrix, and endpoints of the latus rectum

61. $y^2+3x-2y-11=0$

62. $x^2-6x+10y-1=0$

Find the center, the foci, the endpoints of the major and minor axes.

63. $\frac{x^2}{36}+\frac{y^2}{81}=1$

64. $169x^2+y^2+2366x=4y-8116$

Find the center, the foci, the vertices, the endpoints of the latus rectum and the equations of the asymptotes.

65. $\frac{x^2}{16}-\frac{y^2}{4}=1$

66. $3x^2-12y^2+45x+60y=-60$

Graph the system.

67. $x^2+4y^2\le 16$
$x^2\le y^2+4$

68. $x^2+y^2>16$
$x+y=2$

69. **Solve the system by elimination.**
$2x^2-3y^2=30$
$x^2+y^2=25$

70. **Solve the system by substitution.**
$x^2+y^2=13$
$xy+6=0$

Solve.

71. The product of a two-digit number and its tens digit is 285. The units digit is two more than the tens digit. Find the original number.

72. A rectangular plot of land having area 1350 m^2 is to be enclosed and divided into two parts, as shown. Find the dimensions of the plot if the total length of fencing used is 180 m.

Simplify.

73. $x^{-\frac{5}{6}}$

74. $\frac{g^{\frac{3}{2}}+3g^{-\frac{1}{2}}}{g^{\frac{1}{2}}}$

75. $\frac{b^{-\frac{1}{2}}}{8b^{\frac{1}{3}}\cdot b^{-\frac{1}{4}}}$

76. $\frac{(\sqrt{2}-1)^{2+\pi}}{(\sqrt{2}-1)^{\pi}}$

77. $\sqrt[4]{\frac{9^{1-\pi}}{9^{1+\pi}}}$

78. $\sqrt{\frac{2^{\sqrt{3}+3}}{8}}$

Solve each equation.

79. $49^{x-2}=7\sqrt{7}$

80. $4^{2x}-63\cdot 4^x-64=0$

81. $2^{(2/3)x+1}-3\cdot 2^{(1/3)x}-20=0$

If $f(x)=6x+1$, $g(x)=\sqrt{x}$ and $h(x)=x^2-2x+1$, find the following.

82. $f(g(x))$

83. $g(h(x))$

84. $h(g(f(x)))$

Find the inverse for each.

85. $f(x)=-\frac{3}{4}x+5$

86. $g(x)=\frac{1}{3}(x-4)^2+3$

Determine whether the sequence is arithmetic, geometric or neither. Then supply the missing terms of the sequence.

87. -2,0,2,4,__?__, __?__,

88. $\frac{1}{2}$, -1, 2,__?__,8, __?__

89. 1, ?, 27,64,125, ?,

90. 0.1, 0.01, 0.001, ?, ?,

The sequence is either arithmetic or geometric. Find the equation for the nth term and then find the specified term.

91. 99,95,91, … t_{20}

92. $-2,\frac{1}{2},-\frac{1}{8},...t_7$

93. For an arithmetic sequence, $t_{10}=10$ and $t_7=12$, find t_2.

94. For a geometric sequence, $t_8=60$ and $t_6=72$, find t_{12}.

Write the series using sigma notation.

95. 3+5+7+…+41

96. $-2+6-18+54-...-1458$

97. $\frac{1}{2}-\frac{1}{3}+\frac{1}{4}+...$

Find the sum if it exists.

98. $\sum_{n=5}^{28}-4n+13$

99. $\sum_{n=1}^{10}3(2)^{n-1}$

100. $\sum_{n=1}^{\infty}3(2)^{n-1}$

101. $\sum_{n=1}^{\infty}9\left(\frac{2}{3}\right)^{n-1}$

Express each repeating decimal as a rational number.

102. 0.727272…

103. 6.0606060606…

104. **Expand.** $\left(x^3-\frac{x}{3}\right)^7$

105. **Find the fifth term of** $(a-3b)^{12}$

106. **Find the term containing** x^4 **in** $\left(x+\frac{1}{x^2}\right)^8$

Solve.

107. A toxic substance deteriorates at a rate such that one-third of it is converted to a non-toxic product every 10 years. How long does it take for less than 10 kg. of the material to remain from an original amount of 100 kg?

108. A house bought five years ago for $60,000 has increased in value 10% each year. Find its value now.

For problems 109-113, use the data: 79, 88, 93, 81, 88, 76, 76, 97, 88, 84

109. Draw a stem-and-leaf plot for the distribution.

110. Find a) the mode, b) the median, and c) the mean.

111. Find a) the first quartile, b) the third quartile,

112. Draw a box and whisker plot for the

and c) the range. distribution.

113. Calculate the standard deviation.

114. The mean of the math grades at a certain school was found to be 78 with a standard deviation of 9.
Use the table in your book.
a) What percent of the grades is above 96% b) What percent of the grades is between 87 and 96?

115. Graph f(x) = $(x-3)^2(x+4)$

116. Graph f(x) = $-(x-1)^3(x+2)^2$

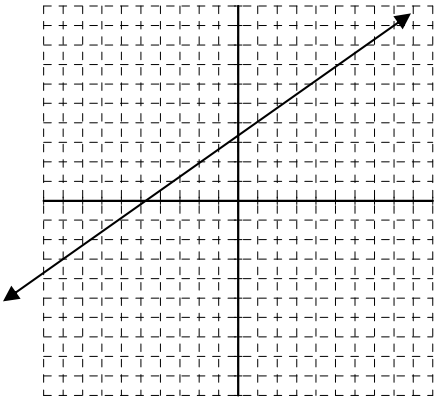
State the domain and range; Is the relation a function?

117. $f(x)=\{(0.75,0.5),(0.75,-0.5),(-0.75,0.5)\}$

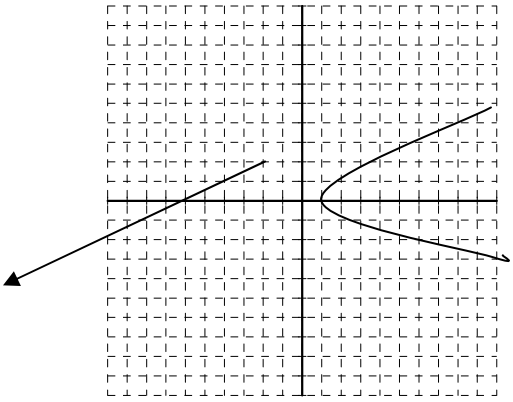
118. $f(x)=\{(-20,-7),(20,0),(0,15),(10,0)\}$

State the domain and range.

119.



120.



121. **State the domain.**

$f(x)=\dfrac{3}{3x^2-13x-10}$

122. **Find the domain of the relation. Function?**

$\{(x,y):|y|=x \text{ and } x\le 3\}$

Evaluate each function.

123. $f(x)=\dfrac{5}{-x^2+2x+7}$ A). $f(-2)$ B) $f(m-2)$

Solve the system by graphing.

124. $\begin{aligned} \frac{1}{2}x &= y-4 \\ 6y &= 3x-24 \end{aligned}$

125. $\begin{aligned} 2x-3y &= 6 \\ -\frac{3}{2}x+y &= -2 \end{aligned}$

Solve each system. Use either substitution or elimination.

126. $\begin{aligned} x+y &= 4(y+2) \\ x-y &= 2(y+4) \end{aligned}$

127. $\begin{aligned} \frac{1}{2}x-\frac{1}{3}y &= 1 \\ \frac{5}{3}x+y &= -3 \end{aligned}$

128. $\begin{aligned} \frac{x}{2}-\frac{y}{3} &= \frac{1}{2} \\ \frac{x}{4}+\frac{y}{3} &= -1 \end{aligned}$

Use a system of equations to solve.

129. A caterer's total cost for a party includes a fixed cost, which is the same for every party, In addition the caterer charges a certain amount for each guest. If it costs $300 to serve 25 guests and $420 to serve 40 guests, find the fixed and cost per guest.

130. Marcia flew her plane to a nearby town against a headwind of 15 km/h in 2h 20min. The return trip with the same wind conditions took 1h 24min. Find the plane's speed and the distance to the nearby town.

131. Kerry asked a bank teller to cash a $390 check using $20 bills and $50 Bills. If the teller gave her 15 bills, how many of each type did she receive?

Graph to find the solution set.

132. $\begin{aligned} x &\geq 0 \\ y &\geq 0 \\ x-y+2 &> 0 \\ 2x-y &< 2 \end{aligned}$

133. $\begin{aligned} y-x &< 3 \\ y+x &< 34 \\ y-1 &> 0 \end{aligned}$

134. $\begin{aligned} 5 &\geq 2|x+1|+1 \\ |y| &> 4 \end{aligned}$

Graph, name the coordinates of the vertices of the feasible region. Find the max & min of each objective function.

135. $f(x,y) = -2x+y$

$\begin{aligned} 2x-4 &\leq y \\ -2x-4 &\leq y \\ 2 &\geq y \end{aligned}$

136. $f(x,y) = x-4y$

$\begin{aligned} 3x-y &\leq 7 \\ 2x-y &\geq 3 \\ y &\geq x-3 \end{aligned}$

Solve using linear programming.

137. The area of a parking lot is 600 square meters. A car requires 6 sq meters. A bus requires 30 sq meters. The attendant can handle 60 vehicles. If a car is charged $2.50 and a bus $7.50, how many of each should be accepted to maximize income?

138. A nutrition center sells health food to mountain-climbing teams. The trail blazer mix package contains one pound of corn cereal mixed with four pounds of wheat cereal and sells for $9.75. The Frontier mix package contains two pounds of corn cereal mixed with three pounds of wheat cereal and sells for $9.50. The center has 60 pounds of corn cereal and 120 pounds of wheat cereal. How many packages of each mix should the center sell to maximize its income?

Solve each system.

139. **By substitution**

$$2x - y + 2z = 15$$
$$-x + y + z = 3$$
$$3x - y + 2z = 18$$

140. **By elimination**

$$2x - 5y + z = 5$$
$$3x + 2y - z = 17$$
$$4x - 3y + 2z = 17$$

Simplify.

141. $-5v^2\left(2r^3v^2\right)\left(rv^3\right)^2$

142. $\dfrac{\left(3x^{-2}y^3\right)\left(5xy^{-8}\right)}{\left(x^{-3}\right)^4\left(y^{-2}\right)}$

143. $\left(\dfrac{x^3yz^2}{xy^2z^3}\right)^2\left(\dfrac{4x^2y^2}{\left(4x^2y\right)^2}\right)$

144. $\dfrac{\left(pq^{-2}\right)^{-1}}{\left(p^2q\right)^{-2}}$

145. $\left(\dfrac{x^{-2}}{y^{-3}}\right)^{-1}\left(\dfrac{x^{-3}}{y^{-2}}\right)^{-2}$

146. $\dfrac{a^{2m}b^{2m+1}}{(a^2b^2)^m}$

147. Factor: $\left(x^2+4\right)^{-1} - 5(x^2+4)^{-2} = (x^2+4)^{-2}(\_\_\_\_?\_\_\_\_\_)$

Express in scientific notation.

148. 0.000718

149. 1,000,000,000,000

Calculate: Keep in proper scientific notation, with same number of significant digits as in the least accurate factor.

150. $\left(3.67\times10^{-3}\right)\left(3.587\times10^{2}\right)$

151. $\dfrac{\left(3.200\times10^{3}\right)\left(8.72\times10^{4}\right)}{5.66\times10^{5}}$

Factor completely.

152. $xy + 2x - 3y - 6$

153. $32x^2 - 48xy + 18y^2$

154. $16x^2 - 1$

155. $x^6 - 64$

156. $p^2 - 4p + 4 - q^2$

157. $(x+1)^3 + 1$

158. $x^6 - y^6$

159. $4x^3 - 19x^2 + 15x$

160. $x^{4n} - 5x^{2n} + 4$

161. $x^{4n} - 2x^{3n}y^n + x^{2n}y^{2n}$

Find the values of a, b, c, or d that make the equation true.

162. $(4t^3 - at^2 - 2bt + 5) - (ct^3 + 2t^2 - 6t + 3) = t^3 - 2t + d$

163. $(2x - a)(3x + 2a) = 6x^2 + ax - 32$

164. $4^{d+3} \cdot 16^{d} = 8^{3d}$

Solve the following equations or inequalities.

165. $3x(x+1) = 4(x+1)$

166. $\frac{1}{6}x^2 + \frac{1}{2}x - \frac{2}{3} = 0$

167. $x^2(x^2+4) \le 4x^3$

168. $\left(x^2 - x - 6\right)\left(x^2 - 2x + 1\right) > 0$

Solve.

169. The top of a 15-foot ladder is 3 ft farther up a wall than the foot of the ladder is from the bottom of the wall. How far is the foot of the ladder from the bottom of the wall?

170. A signal flare is fired upward from ground level with an initial speed of 294 m/s. A balloonist cruising at a height of 2450 m sees it pass on the way up. How long will it be before the flare passes the balloonist again on the way down?

171. A garden plot 5 m by 15m has one of its longer sides next to a wall. The area of the plot is to be doubled by digging up a strip of uniform width along the other three sides. How wide should the border be?

Simplify.

172. $\frac{x^3 + x^2 - x - 1}{x^3 - x^2 - x + 1}$

173. $\frac{3x^2 + xy - 2y}{3x^2 - xy - 2y} \div \frac{3x^2 + 7xy - 6y}{3x^2 - 2xy - y} \div \frac{3x + y}{3x + 2y}$

174. $\frac{1}{2u^2 - 3uv + v^2} + \frac{1}{4u^2 - v^2}$

175. $\dfrac{\frac{a}{b} - \frac{a-b}{a+b}}{\frac{a}{b} + \frac{a+b}{a-b}}$

176. $\dfrac{1 - \frac{2 - \frac{1}{x}}{x}}{1 - \frac{1}{x}}$

Solve.

177. $\frac{t}{t-1} = \frac{1}{t+2} + \frac{3}{t^2 + t - 2}$

178. $\left(\frac{x-3}{x+1}\right)^2 = 2 \cdot \frac{x-3}{x+1} + 3$

Solve.

179. The county's new paving machine can surface 1km of highway in 10 hours. A much older machine can surface 1 km of highway in 18 hours. How long will it take them to surface 21 km of highway if they start at opposite ends and work day and night?

180. Helped by a strong jet stream, a Los-Angeles to Boston plane flew 10% faster than usual and made the 4400 km trip in 30 minutes less time than usual. At what speed does the plane usually fly?

181. Kevin drives 320 mi to a mountain resort. His return trip took 20 minutes longer because his speed was 4 mi/hour slower than his speed going. At what speed did he drive to the resort?

182. Members of the Computer Club were assessed equal amounts to raise $1200 to buy some software. When 8 new members joined, the per-member assessment was reduced by $7.50. What was the new size of the club?

Simplify.

183. $\sqrt[3]{250a^7}$

184. $-\sqrt{144m^6n^5}$

185. $\sqrt[3]{81}+\sqrt[3]{16}-\sqrt[3]{24}$

186. $\dfrac{8\sqrt{6}-4\sqrt{3}}{2\sqrt{3}}$

187. $\dfrac{10}{2\sqrt{3}-\sqrt{7}}$

188. $\sqrt[3]{24}\sqrt[3]{54}\sqrt[3]{8}$

189. $\left(\sqrt[3]{\dfrac{27}{64}}\right)^{-1}$

190. $\dfrac{24}{\sqrt[3]{6^2}}$

Solve.

191. $\sqrt[4]{2x}+2=6$

192. $\sqrt{x+3}-\sqrt{x-1}=1$

193. $\sqrt{2u+10}-2\sqrt{u}=5$

Simplify.

194. $\sqrt{-48}$

195. $-\sqrt{-15}$

196. $\left(\sqrt{-16}\right)\left(\sqrt{-25}\right)$

197. i^{49}

198. i^{158}

Perform the given operation.

199. $(-4+i)(i-4)$

200. $i(-7-i)(3+2i)$

201. $3i\left[2i(1+i)-(2-10i)\right]$

202. $\dfrac{4+3i}{5-2i}$

203. $\dfrac{-10-4i}{7i}$