

Problem Set 63

15. Graph (a) $f(x) = 2^x$, and
(b) $g(x) = -2^x$
on the same set of axes.
16. Graph (a) $p(x) = 2^x - 4$, and
(b) $r(t) = 2^{x-4}$
on the same set of axes.
19. $\frac{(y^a)^{b+2} y^{-ab}}{y^{-2+a}}$
23. Solve $-8x - 1 = 2x^2$ by using the quadratic formula.

Problem Set 68

1. Find three consecutive even integers such that the product of the first and the second is 8 greater than the product of -10 and the third.
2. It was necessary to mix 1000 gallons that was 56% fluorine. If one solution was 20% fluorine and another was 80% fluorine, how much of each should be used?
9. Graph (a) $49x^2 + 25y^2 = 1225$, and (b) $4x^2 + 9y^2 = 144$ on the same set of axes.
13. Graph (a) $y = \frac{2}{3}(x-3)^2 + 1$, and (b) $y = -\frac{3}{2}(x-3)^2 + 1$ on the same set of axes.
17. Graph $f(x)$ and $f^{-1}(x)$ on the same set of axes, where $f(x) = \frac{1}{2}x + \frac{3}{2}$.
18. Find $g^{-1}(x)$ if $g(x) = \frac{3-4x}{3x+2}$.
20. Solve for m_1 : $a = x \left(\frac{1}{m_1} + \frac{y}{m_2} \right)$

Problem Set 75

3. The beaker contained 400 ml of a solution that was 20% alcohol. How many milliliters of a 50% alcohol solution must be added so that the result will be 26% alcohol?
8. Without using a calculator evaluate: (a) $\log 10$ (b) $\log 1000$ (c) $\log 0.1$
9. Estimate, and then evaluate: (a) $\log 0.37$ (b) $\log 23$ (c) $\log 872$
10. Solve each equation: (a) $\log_{16} x = \frac{3}{4}$ (b) $\log_x 27 = \frac{3}{2}$ (c) $\log_4 \frac{1}{2} = x$
11. Graph each of the following on the same set of axes.
(a) $f(x) = \log_2 x$ (b) $g(x) = -\log_2 x$ (c) $h(x) = \log_2 x - 3$
13. Graph the conic section whose equation is $x^2 + 6y^2 = 60$. Write the equation(s) that would be used to graph this conic on a graphing calculator.
15. Add: $\frac{4x+2}{x-2} - \frac{3}{2-x}$
17. Convert $(6, -2)$ to polar coordinates.
19. Convert $(20, 340^\circ)$ to rectangular coordinates.
22. Solve:
$$\begin{cases} \frac{2}{3}x - \frac{2}{5}y = -4 \\ 0.2x + 0.9y = 19.2 \end{cases}$$

Problem Set 79

Solve the equation in problems 5, 7, and 9.

5. $3^{x^2} = 27^{2x-3}$
7. $\sqrt[3]{x^3 + 3x^2 - 8} - x - 1 = 0$ 9. $\sqrt{2x+1} + \sqrt{x} = 1$
10. Find the antilogarithm:
(a) base 2 of 4 (b) of -3 base 4 (c) base 10 of 12.4
13. Add: $20 \angle 45^\circ + 10 \angle 210^\circ$
19. Simplify: $\sqrt{-2}\sqrt{-2} - 3i^2 - \sqrt{-9} + 2i^4 + 4 - i^{77}$
20. Graph $(x+4)^2 + (y-3)^2 = 10$. Write the equation(s) that would be used to graph this conic on a graphing calculator. Use a graphing calculator to find the zeros of this conic.
21. Graph $\frac{(x-3)^2}{28} + \frac{(y+2)^2}{56} = 1$. Find the length of the major and minor axes of this conic.
25. Complete the square to solve $3x^2 - 2x + 5 = 0$. What is the value of the discriminant of this quadratic equation? What does this tell us about the graph of the function $y = 3x^2 - 2x + 5$?

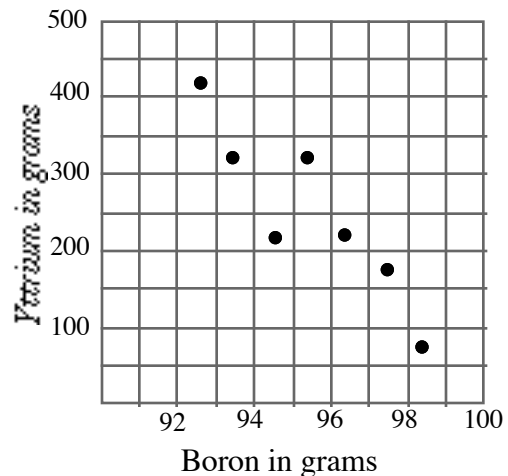
Problem Set 87

- The varsity volleyball team has 12 girls on the roster. Only 6 girls can play at a time. How many different ways could the coach choose 6 girls from the 12 on the roster?
- The number of folk dancers needed at the festival varied directly as the number of people who attended the festival. When 4800 attended, 240 dancers were needed. How many attended the festival if 600 dancers were needed? Use the constant method.
- The number of macaws varied inversely as the number of apes squared. When there were 4 macaws, there were 10 apes. How many macaws were there when there were only 2 apes? Use the ratio method.
- Arrange the following lengths in order from shortest to longest: 1.4 mi, 34920 cm, 2254 m
- Solve these logarithmic equations:
 - $\log_2 x = \log_2 4$
 - $\log_3 (x + 1) = \log_3 (2x)$
 - $\log_b (3n) = \log_b (n + 2)$
- Evaluate these logarithmic expressions:
 - $\log_7 7^3$
 - $\log_8 8^5$
 - $\log_b b^x$

- Estimate the location of the line indicated by the data points and then write the equation that expresses yttrium as a function of boron:

$$Y = mB + b$$

- Draw a parallelogram vector diagram to estimate the solution to $(6, 40^\circ) + (8, 160^\circ)$.



Add the expressions in problems 18 and 19.

$$18. \frac{5x + 2}{x^2 + 3x - 10} - \frac{2x}{2 - x}$$

$$19. \frac{-7}{-x + 3} - \frac{2x}{x^2 - 9}$$

- Graph the following system. In how many points do the graphs intersect? Is this system consistent, inconsistent, or dependent?

$$\begin{cases} (x - 3)^2 + (y + 2)^2 = 25 \\ \frac{(y + 2)^2}{25} + \frac{(x - 3)^2}{25} = 1 \end{cases}$$

$$29. \text{Simplify: } 9\sqrt{27} \sqrt[3]{3}$$

Problem Set 92

- How many times more powerful was the 1979 Indonesian earthquake that rated 8.1 than the 1971 San Fernando CA earthquake that rated 6.4?
- A good fastball pitcher throws around 95 miles per hour. In feet per second, how fast is the pitcher throwing?
- Evaluate: (a) $\ln 10$ (b) $\log 10$ (c) $\ln 50$ (d) $\log 50$

Solve the logarithmic equations in problems 9 and 10.

- $\log_7 (x + 7) - \log_7 (x - 2) = \log_7 10$ 10. $2 \log_3 x = \log_3 16$
- Find the 23rd term of the arithmetic sequence shown: $-9, -5, -1, \dots$
- Write the recursive definition, and find the 20th term of the arithmetic sequence whose 4th term is 8, and whose 10th term is -10 .

Without using a graphing calculator, graph the system. Tell how many points the graphs intersect in, and identify the system as being consistent, inconsistent, or dependent.

13.
$$\begin{cases} x^2 - y^2 = 4 \\ y^2 - x^2 = 16 \end{cases}$$

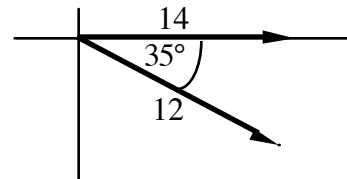
Solve the system in problems 15–17 without using a graphing calculator.

15.
$$\begin{cases} BT_D + 6T_D = 22 \\ BT_D - 6T_D = 10 \end{cases}$$

16.
$$\begin{cases} x^2 + y^2 = 36 \\ 7x + y = 30 \end{cases}$$

17.
$$\begin{cases} x + 2y - z = 0 \\ 3x + y - 2z = 3 \\ 2x - z = 0 \end{cases}$$

19. Two forces are applied to a point as shown. Find the resultant force.



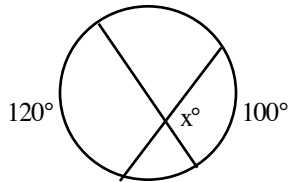
21. Write 3 other polar coordinate representations of the point with coordinates $(-2, 237^\circ)$.

Problem Set 96

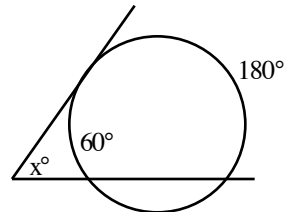
3. Use the relationship $PV = nRT$ to find the number of moles in a quantity of an ideal gas when the temperature is 673 K, the pressure is 5 atmospheres, and the volume is 20 liters ($R=0.0821$).

10. Find the measure of the angle labeled x .

(a)

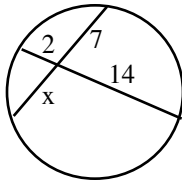


(b)

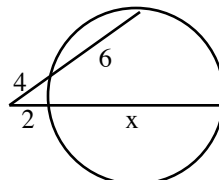


11. Find x .

(a)



(b)

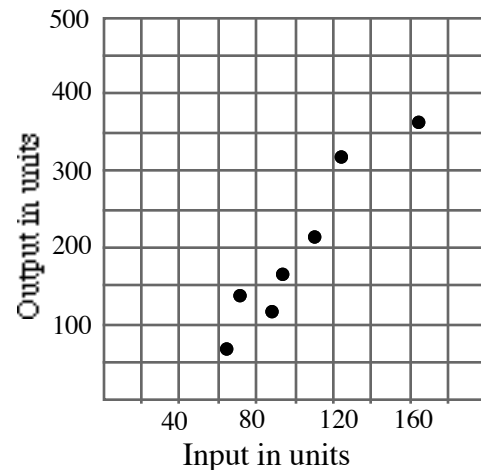


15. Evaluate: $\begin{vmatrix} 2 & 3 \\ 1 & 4 \end{vmatrix}$

17. Write a recursive definition, and a non-recursive definition, and find the 10th term of the geometric sequence that begins 3, 9, 27,

19. Expand: $(x^{1/4} - y^{-1/4})^2$

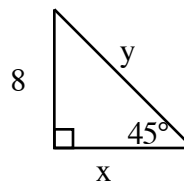
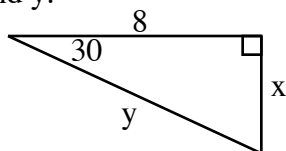
25. Estimate the coordinates of the 7 data points on the scatter plot at the right (write them down). Use this data to find a linear regression model that fits the scatter plot.



27. Let $f(x) = -\sqrt{x} + 4$, and $g(x) = x - 3$.

- Find the domain of $f(x)$.
- Find $f(g(x))$.
- Find the domain of $f(g(x))$.
- Graph $y = f(g(x))$.

29. Find x and y .



Problem Set 98

1. If \$500 is deposited in an account that pays 7.25% annual compound interest, what will the account be worth in 10 years? After how many years will the account be worth \$2000?

Problem Set 101

5. The pressure of a quantity of an ideal gas at a temperature of 127°C was 740 millimeters of mercury. If the volume was not changed, what would the pressure be if the temperature was raised to 1327°C? Begin by adding 273 to convert degrees Celsius to kelvins.

7. Complete the square as an aid in graphing: $y = -x^2 - 4x - 5$

8. It was found that the number of errors on the math test was related to the number of hours spent doing math problems the previous week by the function

$$E(x) = \frac{1}{8}x^2 - 2x + 10$$

where $E(x)$ is the number of errors and x is the number of hours spent working math problems. According to this function, how many hours should be spent working math problems in order to minimize the number of errors?

9. Graph on a number line: $-x + 3 \leq -2$ or $-x + 3 < -5$; $D = \{\text{Integers}\}$

11. Graph the solution to $\begin{cases} x - y < -2 \\ y \geq -2 \end{cases}$ on a Cartesian coordinate plane.

15. Solve the system: $\begin{cases} x^2 + y^2 = 3 \\ x - y = 2 \end{cases}$ Do not use a graphing calculator.

16. Graph: $y = [x] + 3$
17. Multiply: $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$

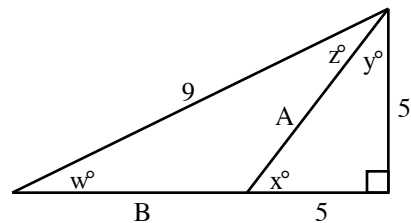
19. Solve $\ln(x - 9) + \ln 2 = \ln 45$

21. Solve $\begin{cases} y = \sqrt{x+1} \\ y = x^2 \end{cases}$ by using a graphing calculator. Find the zeros of $y = x^2 - \sqrt{x+1}$ by using a graphing calculator.

23. The numerical value of the area of a rectangle, whose length is 5 more than its width, is twice the numerical value of its perimeter. Find the dimensions of the rectangle.

25. Multiply: $(x^{1/3} + y^{1/3})(x^{2/3} - x^{1/3}y^{1/3} + y^{2/3})$

29. Find A , B , w , x , y , and z .



Problem Set 105

1. The speed of the bicycle was directly proportional to the effort (on a scale of 1 to 10) of the rider and inversely proportional to the square of the speed of the head wind being ridden into. When the wind speed was 10 mph and the effort was 5, the speed was 15. What was the speed of the bike if the effort was 8 and the wind speed was 20 mph?

3. The current in the river was 8 miles per hour. The boat could go 60 miles upstream in one-half the time it took to go 280 miles downstream. How fast could the boat go in still water?

5. The weight of the chlorine (Cl) in a quantity of the compound $C_3H_3Cl_5$ was 1020 grams. What was the total weight of the compound, and what percent by weight of the compound is the chlorine? (C, 12; H, 1; Cl, 35)

9. Write $\frac{(x-3)^2}{5} + \frac{(y+2)^2}{4} = 1$ in general form.

10. Identify each of the following conics and give a reason for your answer.

(a) $2x^2 + 4y^2 + 6x - 5y + 2 = 0$

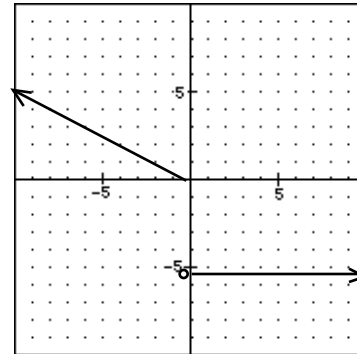
(b) $2x^2 - 4y^2 + 6x - 5y + 2 = 0$

(c) $4x^2 + 6x - 5y + 2 = 0$

(d) $4x^2 - 4y^2 + 6x - 5y + 2 = 0$

11. Graph:
$$\begin{cases} 2, & x \leq 0 \\ x, & 0 < x \leq 2 \\ 3 - x, & x > 2 \end{cases}$$

12. Write the equation of the function shown below.



13. Simplify: $\sqrt[4]{x^4 y^4 z^8}$

15. Solve: $5^{4x+3} = 9^{2x-1}$

Graph the solution to problems 17 and 19 on a number line.

17. $-4 \leq x + 3 < 7$; $D = \{\text{Integers}\}$

19. $|x| + 3 \leq 5$; $D = \{\text{Reals}\}$

Solve the system in problems 21–23.

21.
$$\begin{cases} 3x + y + z = 7 \\ x - 2y - z = 2 \\ -x + y - z = -5 \end{cases}$$

22.
$$\begin{cases} x - 3y = 2 \\ xy = 8 \end{cases}$$

23.
$$\begin{cases} x^2 + y^2 = 8 \\ 2x^2 - y^2 = 7 \end{cases}$$

25. Find: (a) the $[H^+]$ if pH equals 10.3.
(b) pH if the $[H^+]$ equals 1.79×10^{-6} .

27. Simplify: $\frac{2 - 3i^3}{i + 2i^2 + 3i^3}$