

8.1 EXERCISES

 PRACTICE

In Exercises 1–15, find the indicated function values, if possible.

1. $f(x, y) = 12x - 3y + xy$
 - a. $f(1, 3)$
 - b. $f(0, 4)$
2. $f(x, y) = 7xy - 11x + 9y$
 - a. $f(-2, 1)$
 - b. $f(3, -2)$
3. $f(x, y) = 4x^2 - 3xy + y^2$
 - a. $f(2, 5)$
 - b. $f(0, 3)$
4. $g(x, y) = 2xy + 5x^2y + y^3$
 - a. $g(-2, 2)$
 - b. $g(-1, -1)$
5. $g(x, y) = \frac{4x+y}{x-y}$
 - a. $g(3, -1)$
 - b. $g(2, 2)$
6. $f(x, y) = \frac{2x-y}{x^2+y}$
 - a. $f(6, 2)$
 - b. $f(3, -9)$
7. $g(x, y) = \frac{8x^2y}{\sqrt{2x+y}}$
 - a. $g(1, -4)$
 - b. $g(-2, 6)$
8. $f(x, y) = \frac{5x^2+y^3}{\sqrt{4x+y^2}}$
 - a. $f(-1, 3)$
 - b. $f(3, 2)$
9. $g(x, y) = 3xe^{x+y}$
 - a. $g(2, 1)$
 - b. $g(-1, 0)$
10. $g(x, y) = ye^{4x} + 2xy$
 - a. $g(1, 5)$
 - b. $g(-1, 3)$
11. $f(x, y) = x \ln xy + y \ln x$
 - a. $f(1, e)$
 - b. $f(e^2, 1)$
12. $f(x, y) = 2x^3y + \ln y$
 - a. $f(-2, e)$
 - b. $f(3, 1)$
13. $A(P, r, t) = Pe^{rt}$
 - a. $A(1000, 0.08, 4)$
 - b. $A(500, 0.06, 5)$
14. $A(P, r, t) = P\left(1 + \frac{r}{4}\right)^{4t}$
 - a. $A(1500, 0.08, 6)$
 - b. $A(800, 0.06, 10)$
15. $S(l, w, h) = 2lw + 2lh + 2wh$
 - a. $S(18, 15, 9)$
 - b. $S(14, 9, 11)$

In Exercises 16–19, draw a three-dimensional coordinate system, and graph and label the given points.

16. $A(0, 0, 3)$; $B(2, -1, 0)$; $C(4, 2, 1)$; $D(3, -2, -2)$
17. $A(0, 1, 0)$; $B(3, 0, -4)$; $C(1, 1, -3)$; $D(-2, 3, 0)$
18. $A(-3, 0, 2)$; $B(0, 0, 2)$; $C(2, -2, 2)$; $D(0, -2, 2)$
19. $A(-3, -2, 1)$; $B(4, 0, -1)$; $C(0, 0, 4)$; $D(-1, 4, -1)$

In Exercises 20–25, draw a three-dimensional coordinate system, and graph the given planes.

20. $x = 0$

21. $y = 0$

22. $z = 0$

23. $x = 3$

24. $y = 2$

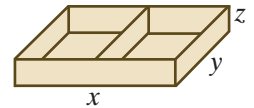
25. $z = 4$

APPLICATIONS

- 26. Stock yield:** The yield of a stock is given by the function $Y(d, p) = \frac{d}{p}$, where d is the dividend per share of stock and p is the price per share. Find the yield of a stock that sells for \$5.88 if the dividend is \$1.00.
- 27. Intelligence quotient:** The intelligence quotient (IQ) of a person is determined by $f(M, C) = 100 \cdot \frac{M}{C}$, where M is the mental age (determined by tests) and C is the actual or chronological age. Find the IQ of a child who is 13 years old and has a mental age of 15.4 years. (Round to the nearest integer.)
- 28. Cobb-Douglas production:** The number of units of a product that are manufactured by a company is given by $f(L, K) = 300L^{0.4}K^{0.6}$, where L is the units of labor and K is the units of capital.
- How many units of a product will be manufactured by utilizing 30 units of labor and 24 units of capital? (Round to the nearest unit.)
 - How many units will be produced if the number of units of labor and capital are doubled? (Round to the nearest unit.)
- 29. Cost:** A company manufactures two lawn mower models, standard and self-propelled. The cost of producing each standard mower is \$80, and the cost of producing each self-propelled mower is \$140. If the fixed costs are \$5200, the total cost function is given by $C(x, y) = 5200 + 80x + 140y$, where x is the number of standard and y is the number of self-propelled mowers.
- Find $C(30, 20)$.
 - Find $C(36, 25)$.
- 30. Cost:** The cost function for producing two models of a product is found to be $C(x, y) = 850 + 32x + 20y$, where x is the number of model A and y is the number of model B. The cost for model A is \$32, the cost for model B is \$20, and the fixed costs are \$850 per week.
- Find $C(40, 24)$.
 - Find $C(60, 38)$.
- 31. Cost:** The cost of producing the standard model of a video camera is \$160. The cost of producing the deluxe model is \$220.
- If a company has weekly fixed costs of \$1360, find the cost function $C(x, y)$, where x is the number of standard models and y is the number of deluxe models.
 - Find $C(15, 12)$.
- 32. Cost:** A company makes two grades of paint, grade I, guaranteed for 5 years, and grade II, guaranteed for 10 years. A gallon of grade I costs \$3.20 to make, while a gallon of grade II costs \$3.90 to make. The weekly fixed costs are \$4500.
- Find the cost function $C(x, y)$ for making x gallons of grade I and y gallons of grade II.
 - What is the cost of making 200 gallons of grade I and 140 gallons of grade II?

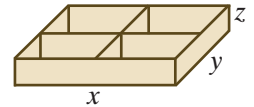
- 33. Revenue:** A grocery store sells two brands of a product, the store brand and a name brand. The manager estimates that if she sells the store brand for x dollars and the name brand for y dollars, she will be able to sell $64 - 20x + 18y$ units of the store brand and $52 + 16x - 22y$ units of the name brand.
- Find the revenue function $R(x, y)$.
 - What is the revenue if she sells the store brand for \$4.00 and the name brand for \$4.50?
- 34. Revenue:** A pharmacy sells two cold remedies, one a generic remedy and the other a name brand. The store manager has determined that he can sell $26 - 6x + 8y$ bottles of the generic remedy and $22 + 5x - 9y$ bottles of the name brand if the prices are x dollars per bottle and y dollars per bottle, respectively.
- Find the revenue function $R(x, y)$.
 - What is the revenue if the generic remedy is priced at \$6.20 per bottle and the name brand is priced at \$7.00 per bottle?

- 35. Volume and surface area:** A rectangular box has no top and one partition (see diagram).



- Write a function of three variables for the number of cubic units in the volume of the box.
- Write a function of three variables for the number of square units of material needed to construct the box.

- 36. Volume and surface area:** A rectangular box has no top and two intersecting partitions (see diagram).



- Write a function of three variables for the number of cubic units in the volume of the box.
- Write a function of three variables for the number of square units of material needed to construct the box.

- 37. Compound interest:** A deposit of \$1000 is made into a savings account earning interest compounded quarterly. The amount $A(r, t)$ after t years is given by $A(r, t) = 1000 \left(1 + \frac{r}{4}\right)^{4t}$, where r is the interest rate in decimal form. Use this function of two variables to complete the following table.

		Number of Years (t)		
		3	5	10
Rate (r)	0.06			
	0.08			
	0.10			

- 38. Interest compounded continuously:** A deposit of \$1000 is made into a savings account earning interest compounded continuously. The amount $A(r, t)$ after t years is given by $A(r, t) = 1000e^{rt}$, where r is the interest rate in decimal form. Use this function of two variables to complete the following table.

		Number of Years (t)		
		5	8	12
Rate (r)	0.080			
	0.085			
	0.100			