

Practice Questions for Math 131 Exam # 1

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 1) A company produces a product for which the variable cost per unit is \$3.50 and fixed cost is \$20,000 per year. Next year, the company wants the total cost to be \$48,000. How many units of the product should be made next year? 1) _____

Answer: 8000

- 2) A company manufactures two types of prefabricated houses: ranch and colonial. Last year they sold three times as many ranch models as they did colonial models. If a total of 2640 houses were sold last year, how many of each model were sold? 2) _____

Answer: 660 colonials, 1980 ranches

- 3) An economics instructor told his class that the demand equation for a certain product is $p = 400 - q^2$ and its supply equation is $p = 20q + 100$. If the $400 - q^2$ is set equal to the $20q + 100$, then the positive solution to the resulting equation gives the "equilibrium quantity." The instructor asked his class to find this quantity. What answer should the class give? 3) _____

Answer: $q = 10$

- 4) The product of two consecutive integers is 42. Find the integers. 4) _____

Answer: 6 and 7, or -7 and -6

- 5) A person deposits \$50 in a bank and in two years it increases to \$56.18. If the bank compounds interest annually, what annual rate of interest does it pay? 5) _____

Answer: 6%

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 6) Suppose consumers purchase q units of a manufacturer's product when the price per unit (in dollars) is $60 - 0.5q$. If no more than 75 units can be sold, then the number of units that must be sold in order that sales revenue be \$1000 is 6) _____

A) 40. B) 50. C) 75. D) 20. E) 25.

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 7) The sum of 3 integers is 27. The second is 3 more than the first, and the third is two more than twice the second integer. Find the three integers. 7) _____

Answer: 4, 7, 16

- 8) A company produces a product at a cost of \$6 per unit. If fixed costs are \$20,000 and each unit sells at \$8, (a) at least how many units must be sold in order to earn a profit; (b) how many units must be sold in order to earn a profit of \$15,000? 8) _____

Answer: (a) 10,001; (b) 17,500

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 9) A company will manufacture a total of 5000 units of its product at plants A and B. At plant A the unit cost for labor and material combined is \$2.50, while at plant B it is \$3.00. The fixed costs at plant A are \$6000 and at plant B they are \$8000. Between the two plants the company has decided to allot no more than \$28,000 for total costs. The minimum number of units that must be produced at plant A is 9) _____
- A) 2000. B) 2545. C) 1871. D) 2500. E) 2546.

Answer: A

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 10) The relationship between Fahrenheit and Celsius temperature is given by the formula $\frac{F - 32}{180} = \frac{C}{100}$. Normal body temperature is $F \geq 98.6$. Find the corresponding Celsius temperature. 10) _____

Answer: $C \geq 37$

- 11) A student receives grades of 63, 75, 66 in three midterms (out of 100 points). The final exam is worth 200 points. The student needs at least 70% to get a grade of C in the course. How many points, at least, must the student obtain (out of 200 points) to get a grade of C? 11) _____

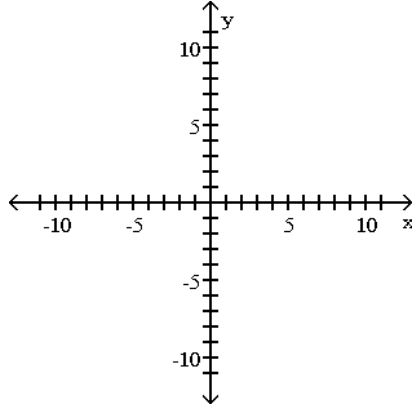
Answer: 146

- 12) A company manufactures water filters that cost \$15 for labor and material, plus \$50,000 in fixed costs. If they sell the water filter for \$20, how many must be sold to make a profit? 12) _____

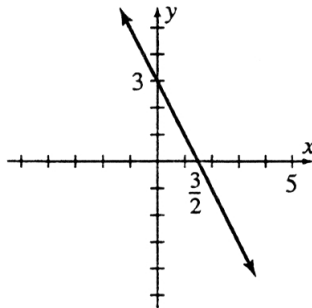
Answer: at least 10,000 filters

13) For the straight line $2x + y - 3 = 0$ find: (a) the slope; (b) the y-intercept; and (c) sketch the graph.

13) _____



Answer: (a) -2 (b) 3
(c)



14) Find a general linear equation of the line that passes through point $(1, -2)$ and has slope 3.

14) _____

Answer: $3x - y - 5 = 0$

15) Find a general linear equation of the line that passes through the points $(-2, 5)$ and $(5, 2)$.

15) _____

Answer: $3x + 7y - 29 = 0$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

16) Which of the following statements are true?

16) _____

- I. Slope is not defined for a vertical line.
- II. A line that falls from left to right has a negative slope.
- III. A line with slope $\frac{1}{3}$ is more nearly horizontal than a line with slope $\frac{2}{3}$.

- A) I only
- B) II only
- C) I and II only
- D) I and III only
- E) all of the above

Answer: E

17) The slope and y-intercept of the line $6x - 5y + 4 = 0$ are

17) _____

- A) -5 and 4, respectively.
- B) $\frac{6}{5}$ and 4, respectively.
- C) $\frac{5}{6}$ and $\frac{5}{4}$, respectively.
- D) $-\frac{5}{6}$ and $\frac{2}{3}$, respectively.
- E) $\frac{6}{5}$ and $\frac{4}{5}$, respectively.

Answer: E

18) A line has slope $\frac{3}{2}$ and passes through the point (4, 2). The point on the line that has its second coordinate equal to -5 is

18) _____

- A) $\left(-\frac{15}{2}, -5\right)$.
- B) $\left(-\frac{2}{3}, -5\right)$.
- C) $\left(-\frac{1}{3}, -5\right)$.
- D) $\left(-\frac{3}{2}, -5\right)$.
- E) $\left(-\frac{7}{2}, -5\right)$.

Answer: B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

19) Determine whether the following lines are parallel, perpendicular or neither.

19) _____

$$\begin{aligned}6x + 2y &= 8 \\9x + 3y &= 16\end{aligned}$$

Answer: parallel

20) Find the equation of a line which is parallel to the line $2x + 3y - 7 = 0$ and passes through the point (-1, 2).

20) _____

Answer: $2x + 3y - 4 = 0$

21) Find the equation of a line which is perpendicular to the line $2x + 3y - 57 = 0$ and passes through the point (1, -1).

21) _____

Answer: $3x - 2y - 5 = 0$

22) 10 square yards of a good quality wool carpet costs \$400 and 20 square yards costs \$800. Use a graphing calculator to show the relationship between cost and amount purchased. Find and interpret the slope.

22) _____

Answer: 40; the carpet costs \$40 per sq yd

23) A baby weighs 9 pounds at birth and 30 pounds at age 3. Use a graphing calculator to graph the resulting equation and determine how much the child will weight at age 12.

23) _____

Answer: $y = 7x + 9$; 93 pounds

- 24) Suppose that a manufacturer will place 1000 units of a product on the market when the price is \$10 per unit, and 1400 units when the price is \$12 per unit. Find the supply equation for the product assuming the price p and quantity q are linearly related. 24) _____

Answer: $p = \frac{1}{200}q + 5$

- 25) Suppose the cost to produce 100 units of a product is \$5000, and the cost to produce 125 units is \$6000. If cost c is linearly related to output q , find an equation relating c and q . 25) _____

Answer: $c = 40q + 1000$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 26) Suppose $f(1) = -5$ and $f(-2) = 4$. Find $f(x)$ if f is a linear function. 26) _____

A) $f(x) = -3x + 5$

B) $f(x) = \frac{x}{3} - \frac{16}{3}$

C) $f(x) = -\frac{x}{3} + \frac{14}{3}$

D) $f(x) = -3x - 2$

E) $f(x) = \frac{x}{3} + \frac{2}{3}$

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 27) An investor has \$12,000 to purchase stock in two companies. If the first stock sells for \$45 per share, and the second stock sells for \$62 per share, find an equation that shows the possible ways to purchase the stock. 27) _____

Answer: $x =$ number of shares of the first stock purchased; $y =$ number of shares of the second stock purchased; $45x + 62y = 12,000$

- 28) For the parabola $y = f(x) = x^2 - 2x - 8$, find: (a) the vertex, (b) the y -intercept, and (c) the x -intercepts. 28) _____

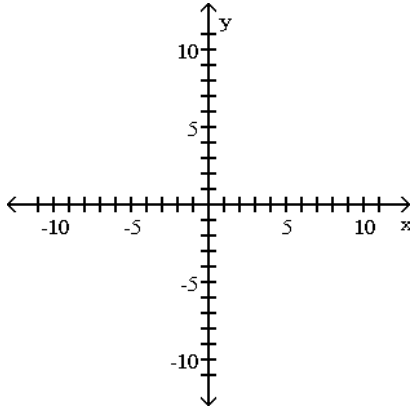
Answer: (a) $(1, -9)$ (b) -8 (c) -2 and 4

- 29) For the parabola $y = f(x) = 4 - x - 3x^2$, find: (a) the vertex, (b) the y -intercept, and (c) the x -intercepts. 29) _____

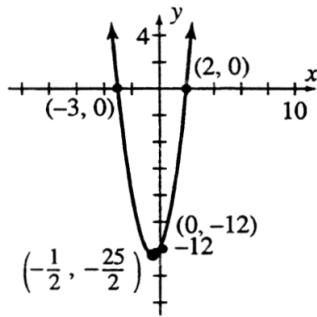
Answer: (a) $\left(-\frac{1}{6}, \frac{49}{12}\right)$ (b) 4 (c) 1 and $-\frac{4}{3}$

30) Graph the function $y = f(x) = 2x^2 + 2x - 12$ and indicate the coordinates of the vertex and intercepts.

30) _____



Answer:



MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

31) Find the minimum value of $g(x) = 3x^2 - 3x + 4$.

31) _____

- A) 0 B) $\frac{13}{4}$ C) 4 D) $\frac{1}{2}$ E) $-\frac{5}{2}$

Answer: B

32) The demand function for a manufacturer's product is $p = f(q) = 800 - 2q$, where p is the price (in dollars) per unit when q units are demanded (per week). Find the level of production that maximizes the manufacturer's total revenue.

32) _____

- A) 125 B) 100 C) 175 D) 150 E) 200

Answer: E

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

33) Suppose that the vertex of the parabola $y = 3x^2 - 6x + k$ is $(1, 2)$; find k .

33) _____

Answer: $k = 5$

34)

Solve the following system algebraically:
$$\begin{cases} \frac{1}{2}x - \frac{1}{4}y = \frac{1}{6} \\ x + \frac{1}{2}y = \frac{2}{3} \end{cases}$$

Answer: $x = \frac{1}{2}, y = \frac{1}{3}$

34) _____

35) Solve the following system algebraically:

$$\begin{cases} 2x + y + z = 0 \\ 4x + 3y + 2z = 2 \\ 2x - y - 3z = 0 \end{cases}$$

Answer: $x = -\frac{1}{2}, y = 2, z = -1$

35) _____

36) A business woman has \$300,000 of profits from her office supply company invested in two investments. One has a yearly return of 6% and the other has a yearly return of 7%. If the total yearly income from the investments is \$19,300, how much is invested at each rate?

Answer: \$170,000 at 6% and \$130,000 at 7%

36) _____

37) A young family with two children has \$40,000 saved for college costs, with part invested at 12% and part invested at 8%. If the total yearly income from the investments is \$3400, how much is invested at each rate?

Answer: \$35,000 at 8% and \$5000 at 12%

37) _____

38) Solve the system:
$$\begin{cases} y = \sqrt{x - 4} \\ x - y = 4 \end{cases}$$

Answer: $x = 5, y = 1; x = 4, y = 0$

38) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

39) The number of solutions of the system
$$\begin{cases} x^2 + y^2 = 7 \\ x^2 - y^2 = 1 \end{cases}$$
 is

- A) zero. B) one. C) two. D) three. E) four.

Answer: E

39) _____

40) A manufacturer sells his product at \$23 per unit, selling all he produces. His fixed cost is \$18,000 and his variable cost per unit is \$18.50. The level of production at which the manufacturer breaks even is

- A) 3000 units. B) 3500 units. C) 4000 units. D) 4500 units. E) 5000 units.

Answer: C

40) _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

41) Suppose the supply and demand equations for a manufacturer's product are $p = \frac{3}{100}q + 6$ 41) _____

and $p = -\frac{1}{50}q + 14$, respectively, where q represents number of units and p represents price per unit in dollars. Determine (a) the equilibrium quantity; (b) the equilibrium price. If a tax of \$1.00 per unit is imposed on the manufacturer, (c) determine the new equilibrium quantity; (d) the new equilibrium price.

Answer: (a) 160 units (b) \$10.80 (c) 140 (d) \$11.20

42) Suppose that the supply and demand equations for a certain product are $p = \frac{1}{14}q - 9$ and 42) _____

$p = -\frac{1}{70}q + 3$, respectively, where p represents the price per unit in dollars and q represents the number of units per time period.

(a) Find the equilibrium price algebraically.

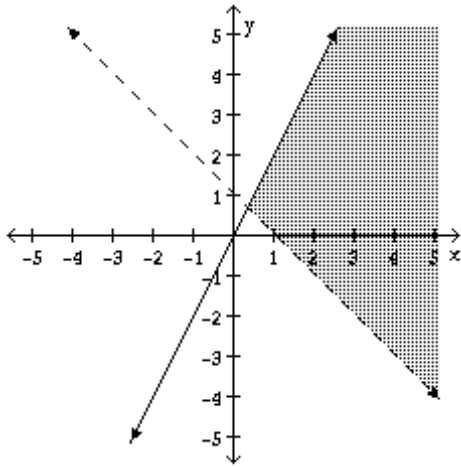
(b) Find the equilibrium price when a tax of 50 cents per unit is imposed.

Answer: (a) $p = 1$ (b) $p = .91$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

43) The region indicated in the diagram

43) _____



is described by

A)
$$\begin{cases} y \leq 2x \\ x + y \geq 1 \end{cases}$$

B)
$$\begin{cases} y \leq 2x \\ x + y > 1 \end{cases}$$

C)
$$\begin{cases} y \geq 2x \\ x + y > 1 \end{cases}$$

D)
$$\begin{cases} y \leq 2x \\ x + y \leq 1 \end{cases}$$

E)
$$\begin{cases} y < 2x \\ x + y > 1 \end{cases}$$

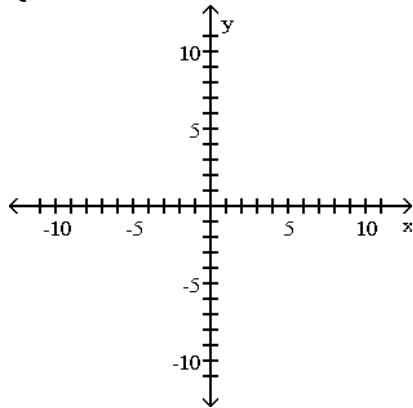
Answer: B

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

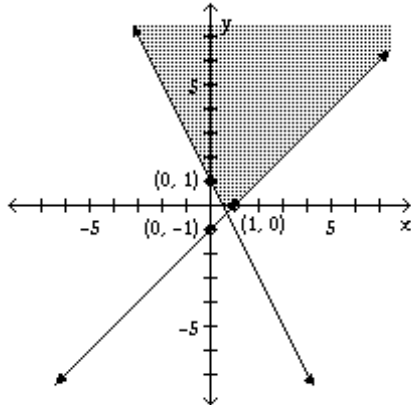
44) Sketch the region described by the inequalities

44) _____

$$\begin{cases} 2x + y \geq 1 \\ x - y \leq 1 \end{cases}$$



Answer:



45) A car rental company has \$540,000 to purchase up to 25 new cars of two different models. One model costs \$18,000 each and the other model costs \$24,000 each. Write a system of linear inequalities to describe the situation. Let x represent the first model and y represent the second. Find the region described by the system of linear inequalities.

45) _____

Answer: $x \geq 0$; $y \geq 0$; $x + y \leq 25$; $18000x + 24,000y \leq 540,000$; The region consists of points on or above the x -axis and on or to the right of the y -axis. In addition, the points must be on or below the line $x + y = 25$ and on or below the line $18,000x + 24,000y = 540,000$ (or, equivalently, $3x + 4y = 90$).

46) Maximize

46) _____

$$Z = 4x + y$$

subject to

$$\begin{cases} -x + y \leq 2 \\ 3x + y \leq 18 \\ x, y \geq 0. \end{cases}$$

Do not use the simplex method.

Answer: $Z = 24$ when $x = 6$, $y = 0$

47) Maximize

$$Z = 5x - 3y$$

subject to

$$2x - y \leq 8$$

$$2x - 5y \geq 0$$

$$x - y = -2$$

$$x, y \geq 0.$$

Do not use the simplex method.

Answer: no optimum solution (empty feasible region)

47) _____

48) Use the corner-point technique to maximize

$$Z = x + 2y$$

subject to

$$y \geq x + 3$$

$$x + 2y \leq 24$$

$$x, y \geq 0.$$

Also determine the values of x and y at which the maximum value occurs.

Answer: 24; $x = (1 - t) \cdot 0 + 6t = 6t$; $y = (1 - t) \cdot 12 + 9t = 12 - 3t$; $0 \leq t \leq 1$

48) _____

49)

Using the method of reduction, solve the system:
$$\begin{cases} 2x - y - 4z = 0 \\ 4x + y - 2z = 0 \\ x - y - 3z = 0 \end{cases}$$

Answer: $x = z$, $y = -2z$, $z = t$

49) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

50)

Reducing $\begin{bmatrix} 2 & 2 & 4 \\ 1 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ gives

A) $\begin{bmatrix} 1 & 0 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$

D) $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$

E) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

Answer: E

50) _____

51)

51) _____

$$\text{If } \begin{cases} x + y - 3z = 5 \\ x - 3y + z = -7, \text{ then} \\ 2x - y - 3z = 2 \end{cases}$$

- A) $x = 5 - 3z, y = 3 + 4z,$ and $z = t.$
 B) $x = 3, y = -1,$ and $z = 4.$
 C) $x = 5, y = -8,$ and $z = 12.$
 D) $x = 2 - 4z, y = -5 + 2z,$ and $z = t.$
 E) none of the above

Answer: E

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

52) Which of the following are reduced matrices?

52) _____

$$A = \begin{bmatrix} 0 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$$

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

Answer: A, B

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

53)

53) _____

$$\text{If } \begin{cases} x - 2y - 4z = 4 \\ 2x + y + z = 9, \text{ then} \\ x + y - z = 1 \end{cases}$$

- A) $x = 5, y = -\frac{5}{2},$ and $z = \frac{3}{2}$
 B) $x = 2z, y = 3 - 4z,$ and $z = t$
 C) $x = 4 - \frac{13}{2}z, y = \frac{11}{2} - \frac{1}{6}z,$ and $z = t$
 D) $x = \frac{22}{5}, y = \frac{1}{5},$ and $z = 0$
 E) none of the above

Answer: A

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

54) For what values of a will the following system of equations have a solution?

54) _____

$$\begin{cases} x - y - 3z = 2 \\ x + y - z = 1 \\ 2x - y - 5z = a \end{cases}$$

Answer: $a = \frac{7}{2}$

55) Find all solutions by reducing the matrix:

55) _____

$$\begin{cases} x - y - 3z = 2 \\ x + y - z = 1 \\ 2x - y - 5z = \frac{7}{2} \end{cases}$$

Answer: $x = \frac{3}{2} + 2z; y = -\frac{1}{2} - z; z$ arbitrary