1. Find the domain and range of the relation \( R = \{(4, -1), (2, -2), (1, 1)\} \).

2. Find the domain and range of the relation \( R = \{(x, y) \mid y = 3x\} \).

3. Find the domain and range of the relation \( R = \{(x, y) \mid y < 2x, \text{ x and y positive integers less than } 6\} \).

4. Which of the following relations is (are) functions? 
   a. \( \{(x, y) \mid y^2 = 2x + 1\} \)
   b. \( \{(x, y) \mid y = 2x^2 + 1\} \)
   c. \( \{(2, 3), (3, 3), (4, 3)\} \)

5. A function is defined by \( f(x) = 2x - x^2 \). Find:
   a. \( f(0) \)
   b. \( f(1) \)
   c. \( f(-2) \)

6. The daily cost for renting a car ($20 per day plus $0.15 per mile) is given by \( C(m) = 20 + 0.15m \), where \( m \) is the number of miles driven. If a person paid $53.75 for one day’s rental, how many miles did the person drive?

7. Graph the relation \( R = \{(x, y) \mid y = 2x, \text{ x an integer between } -2 \text{ and } 2, \text{ inclusive}\} \).
8. Graph the relation $Q = \{(x, y) \mid x + y \leq 2, x \text{ and } y \text{ nonnegative integers}\}$.

9. Graph the function defined by $g(x) = x^2 - 2$, $x$ an integer and $-2 \leq x \leq 2$.

10. Graph the function defined by $f(x) = 2 - 2x$.
11. Graph the equation $2x - 3y = -6$.

12. Find the distance between the two points:
   a. $(1, 0), (3, -4)$
   b. $(7, -2), (7, -12)$

13. Find the slope of the line that goes through the two points $(-2, 1)$ and $(-4, -5)$.

14. Find the general equation of the line in Problem 13.

15. a. Find the slope-intercept form of the equation of the line that goes through the point $(-2, 4)$ and has slope $-3$.
   b. Find the slope-intercept form of the line $3x + 4y = 8$. What is the slope and what is the $y$-intercept?

16. Determine whether or not the two given lines are parallel. If they are not parallel, find the coordinates of the point of intersection.
   a. $2x - y = 7$, $3y = 6x - 15$
   b. $y = 4 - 2x$, $6x + 2y = 9$

17. Find the general equation of the line that passes through the point $(3, 4)$ and is parallel to the line $2x + y = -4$.

18. Find the point of intersection of the lines $x + y = 6$ and $2x - y = 0$. 
19. Graph the solution set of the inequality \[ 2y - 3x \leq 6. \]

20. Graph the solution set of the system of inequalities: \[ 3x + y \geq 6 \] and \[ x + y \geq 2 \]

21. Graph the solution set of the system of inequalities: \[ x + y \leq 3, \quad x \geq y, \quad y \geq 0 \]

22. Solve the following system if possible. If not possible, explain why:
\[
\begin{align*}
y &= 3x - 3 \\
9x - 3y &= 6
\end{align*}
\]
23. Find the maximum value of \( C = 3x + 2y \) subject to the constraints:
   \( x + 2y \geq 6, \quad 0 \leq x \leq 2, \quad \text{and} \quad 0 \leq y \leq 4 \)

24. Find the minimum value of \( P = x - 2y \) subject to the constraints:
   \( x - y \leq 2, \quad x + y \leq 4, \quad x \geq 0, \quad 0 \leq y \leq 2 \)

25. Two machines produce the same item. Machine A can produce 10 items per hour and machine B can produce 12 items per hour. At least 420 of the items must be produced each 40-hour week, but the machines cannot be operated at the same time. If it costs $30 per hour to operate A and $40 per hour to operate B, determine how many hours per week to operate each machine to meet the production requirement at minimum machine cost.

26. Graph \( y = -(x + 1)^2 - 2 \)

27. Graph \( y = x^2 + 2x + 2 \) and give the coordinates of the vertex.
28. Graph $f(x) = 4^x$ and $g(x) = \left(\frac{1}{4}\right)^x$ on the same coordinate axes.

29. Graph $f(x) = e^x$ and $g(x) = \ln x$ on the same coordinate axes.

30. P dollars accumulate to the amount $A = Pe^{rt}$ when invested at a rate $r$ for $t$ years. If the interest rate is 10%, how long would it take for the money to double?
1. The domain of the relation \( R = \{(1, 1), (2, -2), (4, -1)\} \) is
   a. \{-2, -1, 1\}  
   b. \{1, 2, 4\}  
   c. \{-2, -1, 1, 2, 4\}  
   d. \{-2, -1, 1, 2, 4\}  
   e. None of these

2. The range of the relation \( R = \{(x, y) \mid y = 3x\} \) is
   a. The positive real numbers  
   b. The positive integers  
   c. The integers  
   d. The real numbers  
   e. None of these

3. The range of the relation \( \{(x, y) \mid y < 2x, \ x \text{ and } y \text{ positive integers less than 6}\} \) is
   a. \{1, 2, 3, 4, 5\}  
   b. \{1, 2, 3, 4\}  
   c. \{1, 2, 3\}  
   d. \{1, 2\}  
   e. \{1\}

4. Which of the following relations are functions?
   a. \( \{(x, y) \mid y^2 = 2x + 1\} \)  
   b. \( \{(x, y) \mid y = 2x^2 + 1\} \)  
   c. \( \{(2, 3), (3, 3), (4, 3)\} \)  
   a. a only  
   b. b only  
   c. b and c only  
   d. a and b only  
   e. None of these

5. If a function is defined by \( f(x) = 2x - x^2 \), then \( f(2) \) equals
   a. 6  
   b. 2  
   c. 8  
   d. 4x - x^2  
   e. 0

6. The daily cost of renting a car is \( C(m) = 20 + 0.15m \) dollars, where \( m \) is the number of miles driven. If a person paid \$53.75 for one day's rental, the number of miles the person drove is
   a. 175  
   b. 472  
   c. 205  
   d. 225  
   e. 200

7. The graph of \( R = \{(x, y) \mid y = -2x, \ x \text{ an integer between -2 and 2, inclusive}\} \) is
   a.  
   b.  
   c.  
   d.  
   e. None of these
8. The graph of the relation \( Q = \{ (x,y) \mid x + y \leq 2, \text{x and y nonnegative integers} \} \) is

   a. \hspace{1cm} b. \hspace{1cm} c. \hspace{1cm} d. \hspace{1cm} e. None of these

   ![Graphs]

9. The graph of the function defined by \( g(x) = x^2 - 2, \text{x an integer and } -2 \leq x \leq 2 \) is

   a. \hspace{1cm} b. \hspace{1cm} c. \hspace{1cm} d. \hspace{1cm} e. None of these

   ![Graphs]

10. The graph of \( f(x) = 2 - 2x \) is

   a. \hspace{1cm} b. \hspace{1cm} c. \hspace{1cm} d. \hspace{1cm} e. None of these

   ![Graphs]

11. The graph of the equation \( 2x - 3y = -6 \) is

   a. \hspace{1cm} b. \hspace{1cm} c. \hspace{1cm} d. \hspace{1cm} e. None of these

   ![Graphs]
12. The distance between (1, 0) and (3, -4) is
   a. $3\sqrt{2}$  b. 8  c. $\sqrt{6}$
   d. $2\sqrt{5}$  e. None of these

13. The slope of the line through (-2, 1) and (-4, -5) is
   a. 1/3  b. -1/3  c. 3
d. -3  e. None of these

14. The general equation of the line through (1, 2) and (-5, 4) is
   a. $-x - 3y = 7$  b. $x + 3y = 7$  c. $x + 3y = -7$
   d. $x - 3y = 7$  e. None of these

15. The slope and the y-intercept of the line $3x - 4y = -12$ are, respectively,
   a. 4/3, -3  b. 3/4, -3  c. 3/4, 3
   d. 4/3, 3  e. None of these

16. Which of the following lines are parallel?
   1. $y = 4 - 4x$  2. $6x - 2y = 9$  3. $8x + 2y = 9$
   a. 1 and 2 only  b. 1 and 3 only  c. 2 and 3 only
d. All three are parallel.  e. None of these

17. The general equation of the line passing through the point (3, 4) and parallel to the line $2x - y = -4$ is:
   a. $y - 4 = 2(x - 3)$  b. $y = 2x$  c. $2x - y = 2$
   d. $y - 4 = -2(x - 3)$  e. $-2x + y = -8$

18. Find the point of intersection (if there is one) of the lines $2x - y = 7$ and $3y = 6x - 15$
   a. (2, 3)  b. (-2, 3)  c. (-2, -3)
   d. (2, -3)  e. There is none.

19. The graph of the solution set of $2y - 3x \leq 6$ is
   a.  b.  c.  d.  e. None of these
20. The graph of the solution set of the system of inequalities 
\(3x + y \geq 6\) and \(x + y \geq 2\) is:

a. \[\begin{array}{c}
\text{Graph 1}
\end{array}\] 
b. \[\begin{array}{c}
\text{Graph 2}
\end{array}\] 
c. \[\begin{array}{c}
\text{Graph 3}
\end{array}\] 
d. \[\begin{array}{c}
\text{Graph 4}
\end{array}\] 
e. None of these

21. The graph of the solution set of the system of inequalities 
\(3x + 2y \geq 6\), \(x \geq y\), and \(y \geq 0\) is

a. \[\begin{array}{c}
\text{Graph 5}
\end{array}\] 
b. \[\begin{array}{c}
\text{Graph 6}
\end{array}\] 
c. \[\begin{array}{c}
\text{Graph 7}
\end{array}\] 
d. \[\begin{array}{c}
\text{Graph 8}
\end{array}\] 
e. None of these

22. Which system of equations has no solution:

a. \(x + 2y = 9\) \(x + 2y = 7\) 
b. \(x + 2y = 9\) \(4x + 8y = 36\) 
c. \(x + 2y = 9\) \(x - 2y = 7\) 
d. \(x - 2y = 9\) \(x + 2y = 9\) 
e. All of the systems have solutions

23. The maximum value of \(C = 3x + 2y\) subject to the constraints 
\(x + 2y \geq 6\), \(0 \leq x \leq 2\), and \(0 \leq y \leq 4\) is

a. 12 
b. 14 
c. 10 
d. 4 
e. None of these

24. The minimum value of \(P = x - 2y\) subject to the constraints 
\(x - y \leq 2\), \(x + y \leq 4\), \(x \geq 0\), and \(0 \leq y \leq 2\) is

a. 0 
b. 2 
c. -2 
d. -4 
e. None of these
25. Two machines produce the same items. Machine A can produce 10 items per hour and machine B can produce 12 items per hour. At least 420 of the items must be produced each 40-hour week, but the machines cannot be operated at the same time. If it costs $30 per hour to operate A and $40 per hour to operate B, find the number of hours per week machines A and B, respectively, should be operated to minimize the cost.

a. 10 and 30  b. 30 and 10  c. 40 and 0
d. 0 and 35  e. None of these

26. The graph of \( y = -(x + 1)^2 - 2 \) is:

a.  

b.  

c.  

d.  

e. None of these

27. The coordinates of the vertex of \( y = x^2 + 2x + 2 \) are:

a. (-1, 1)  b. (-1, -1)  c. (1, -1)
d. (-2, -2)  e. None of these

28. The graphs of \( f(x) = 4^x \) and \( g(x) = \left(\frac{1}{4}\right)^x \) are, respectively,

a. (1) and (4)  b. (3) and (4)  c. (1) and (4)
d. (1) and (3)  e. None of these
29. The graphs of \( f(x) = e^x \) and \( g(x) = \ln x \) are, respectively,

\[
\begin{align*}
(1) & \quad (2) & \quad (3) & \quad (4) \\
\end{align*}
\]

a. (1) and (4)  b. (2) and (4)  c. (2) and (3)  d. (1) and (3)  e. None of these

30. How long would it take for \( P \) dollars to **double** if they are invested at 10%? Hint: \( A = Pe^{rt} \), where \( P \) is the principal, \( r \) the rate, \( t \) the time in years.

\[
\begin{align*}
a. & \quad \frac{\ln 2}{0.10} & b. & \quad \frac{\ln 2}{10} & c. & \quad \frac{2}{0.10} \\
d. & \quad \frac{\ln 2}{\ln 0.10} & e. & \quad \text{None of these}
\end{align*}
\]