Write the partial fraction decomposition of the rational expression.

1) \[ \frac{x - 2}{(x - 4)(x - 3)} \]

Write the form of the partial fraction decomposition of the rational expression. It is not necessary to solve for the constants.

2) \[ \frac{5x - 4}{x^2 + 10x + 21} \]

Write the partial fraction decomposition of the rational expression.

3) \[ \frac{5x + 7}{(x - 3)^2} \]

Solve the system by the substitution method.

4) \[ y = x - 2 \]
\[ y^2 = -8x \]

Solve the system. Verify your solution by graphing.

5) \[ x^2 + y^2 = 25 \]
\[ x + y = 7 \]

Solve the system. Verify your solution.

6) \[ xy = 4 \]
\[ x + y = 4 \]

Solve the system by the addition method.

7) \[ x^2 - y^2 = 4 \]
\[ 16x^2 + 4y^2 = 64 \]

Graph the linear inequality.

8) \[ -2x - 3y \leq -6 \]

Graph the inequality.

9) \[ x + y < -6 \]

Graph the system of inequalities, and find the coordinates of the vertices.

10) \[ (x - 5)^2 + (y - 4)^2 > 4 \]

11) \[ 2x + y \leq 4 \]
\[ x - 1 \geq 0 \]
12) \[3x - 2y \geq -6\]
\[x - 1 < 0\]

Graph the solution set of the system of inequalities or indicate that the system has no solution.

13) \(y > x^2\)
\[3x + 6y \leq 18\]

Solve the problem.

14) A steel company produces two types of machine dies, part A and part B. The company makes a $3.00 profit on each part A that it produces and a $6.00 profit on each part B that it produces. Let \(x\) = the number of part A produced in a week and \(y\) = the number of part B produced in a week. Write the objective function that describes the total weekly profit.

A) \(z = 6x + 3y\)
B) \(z = 3x + 6y\)
C) \(z = 3(x - 6) + 6(y - 3)\)
D) \(z = 9(x + y)\)

15) A steel company produces two types of machine dies, part A and part B and is bound by the following constraints:
- Part A requires 1 hour of casting time and 10 hours of firing time.
- Part B requires 4 hours of casting time and 3 hours of firing time.
- The maximum number of hours per week available for casting and firing are 100 and 70, respectively.
- The cost to the company is $0.75 per part A and $3.00 per part B. Total weekly costs cannot exceed $45.00.

Let \(x\) = the number of part A produced in a week and \(y\) = the number of part B produced in a week. Write a system of three inequalities that describes these constraints.

16) Mrs. White wants to crochet hats and afghans for a church fundraising bazaar. She needs 8 hours to make a hat and 3 hours to make an afghan, and she has no more than 51 hours available. She has material for no more than 12 items, and she wants to make at least two afghans. Let \(x\) = the number of hats she makes and \(y\) = the number of afghans she makes.

Write a system of inequalities that describes these constraints.

Find the maximum or minimum value of the given objective function of a linear programming problem. The figure illustrates the graph of feasible points.

17) Objective Function: \(z = -x - 8y\)
Find maximum.
An objective function and a system of linear inequalities representing constraints are given. Graph the system of inequalities representing the constraints. Find the value of the objective function at each corner of the graphed region. Use these values to determine the maximum value of the objective function and the values of x and y for which the maximum occurs.

18) Objective Function  
Constraints

19) Write the augmented matrix for the system.

20) Write the system of equations that corresponds to the augmented matrix.

21) Perform the matrix row operation (or operations) and write the new matrix.

22) Solve the system of equations using Gaussian elimination or Gauss-Jordan elimination.

Find the indicated term of the sequence.

27) \( a_n = 7n - 5 \)

28) \( a_n = \left( \frac{1}{9} \right)^{n-1} \)

29) \( a_n = 4n - 1; a_{15} \)

30) \( a_n = (4n - 5)^2; a_9 \)

Evaluate the sum.

31) \( \sum_{k=1}^{4} \frac{1}{4k} \)

32) \( \sum_{k=2}^{5} \frac{1}{2k(k+1)} \)

Evaluate the given binomial coefficient.

33) \( \binom{12}{5} \)

REVIEW
Compute and simplify the difference quotient \( f(x + h) - f(x) \) \( h \), \( h \neq 0 \).

34) \( f(x) = 6x^2 + 9x \)

Graph the function.

35) \( f(x) = \begin{cases} x + 4 & \text{if } x < 1 \\ -2 & \text{if } x \geq 1 \end{cases} \)
Answer the question.

36) How can the graph of \( f(x) = -10x^3 + 3 \) be obtained from the graph of \( y = x^3 \)?

Find the requested function value.

37) Find \((g \circ f)(15)\) when \( f(x) = \frac{x - 3}{6} \) and \( g(x) = 3x + 8 \).

Use the quadratic formula to find the exact solution.

38) \( x^2 + 10x = -16 \)

Solve.

39) \( 6a^3 - 4a^2 + 15a - 10 = 0 \)

Find the vertical asymptote(s) of the graph of the given function.

40) \( g(x) = \frac{7}{x + 5} \)

41) \( f(x) = \frac{x - 1}{x^2 + 3x} \)

Use synthetic division to find the quotient and the remainder.

42) \( (x^3 - x^2 + 6) ÷ (x + 2) \)

Use the compound interest formulas \( A = P \left(1 + \frac{r}{n}\right)^{nt} \) and \( A = Pert \) to solve.

43) Find the accumulated value of an investment of \$15,000 \) at 12\% compounded annually for 7 years.

44) Find the accumulated value of an investment of \$5000 \) at 5\% compounded monthly for 8 years.

45) Suppose that you have \$11,000 \) to invest. Which investment yields the greater return over 10 years: 6.25\% compounded continuously or 6.3\% compounded semiannually?

Simplify.

46) \( 10^{\log t} \)

Express as a single logarithm and, if possible, simplify.

47) \( 5\log_a q - \log_a r \)

Solve the exponential equation.

48) \( 6^2x = 6^{14.4} \)

Solve the logarithmic equation.

49) \( \log_4 x = 5 \)

50) \( \log (3 + x) - \log (x - 4) = \log 2 \)
1) \( \frac{2}{x - 4} + \frac{-1}{x - 3} \)

2) \( \frac{A}{x + 7} + \frac{B}{x + 3} \)

3) \( \frac{5}{x - 3} + \frac{22}{(x - 3)^2} \)

4) \( (-2, -4) \)

5) \( (4, 3), (3, 4) \)

6) \( (2, 2) \)

7) \( (2, 0), (-2, 0) \)

8) 

9) 

10)
11) 

$$\begin{align*}
\text{Answer:} & \quad (1, 2) \\
\text{Shaded region:} & \quad \text{Below line} \quad y = 4x - 4
\end{align*}$$

12) 

$$\begin{align*}
\text{Answer:} & \quad (1, 9/2) \\
\text{Shaded region:} & \quad \text{Below line} \quad y = 4x - 5
\end{align*}$$

13) 

$$\begin{align*}
\text{Shaded region:} & \quad \text{Below line} \quad y = 10 \quad \text{and} \quad y = 5 \quad \text{and} \quad y = -5 \quad \text{and} \quad y = -10
\end{align*}$$

14) B

15) 

$$\begin{align*}
x + 4y & \leq 100 \\
10x + 3y & \leq 70 \\
0.75x + 3y & \leq 45
\end{align*}$$

16) 

$$\begin{align*}
8x + 3y & \leq 51 \\
x + y & \leq 12 \\
y & \geq 2
\end{align*}$$

17) maximum: -20

18) Maximum: 145; at (10, 5)

19) 

$$\begin{bmatrix}
7 & 3 & 57 \\
0 & 7 & 35
\end{bmatrix}$$
Answer Key
Testname: TEST 4 PRACTICE PROBS

20) \[
\begin{bmatrix}
2 & 0 & 3 & 2 \\
0 & 2 & 7 & -4 \\
6 & 7 & 2 & 55
\end{bmatrix}
\]

21) \[7x - 7y = 5\]
\[14x + 15y = -3\]
\[6x + y = 2\]

22) \[x + 5z = -2\]
\[-6x + 7y + 4z = 2\]

23) \[
\begin{bmatrix}
2 & -12 & -5 & -7 \\
1 & 13 & -3 & 0 \\
2 & -7 & 4 & 21
\end{bmatrix}
\]

24) \[
\begin{bmatrix}
1 & 1 & 1 & 1 & 3 \\
0 & -3 & 3 & -5 & 0 \\
-3 & -5 & 1 & -7 & -10 \\
-1 & 6 & -2 & 4 & 2
\end{bmatrix}
\]

25) (0, 6)
26) (-1, -2, 4)
27) 2, 9, 16, 23

28) \[
1, \frac{1}{9}, \frac{1}{81}, \frac{1}{729}
\]

29) 59
30) 961
31) \[
\frac{25}{48}
\]
32) \[
\frac{1}{6}
\]
33) 792
34) 12x + 6h + 9
35) \[
\begin{array}{c}
\text{(1, 5)} \\
\text{y}
\end{array}
\]

36) Stretch it vertically by a factor of 10. Reflect it across the x-axis. Shift it 3 units upward.
37) 14
38) -2, -8
39) \[
\frac{2}{3}
\]
40) \[x = -5\]
41) \( x = 0 \), \( x = -3 \)

42) \( Q(x) = (x^2 - 3x + 6) \); \( R(x) = -6 \)

43) \$33,160.22

44) \$7452.93

45) \$11,000 invested at 6.25% compounded continuously over 10 years yields the greater return.

46) \( t \)

47) \( \log_a \frac{9^5}{r} \)

48) 7.2

49) 1024

50) 11