COLLEGE ALGEBRA
Part I:

1. Simplify \( \left( \frac{2a^{-3}}{b^2} \right)^{-3} \).

2. Find the equation of the line with a slope of \(-1/2\) that contains the point \((8, -1)\).

\[ 6x - 2y = 8 \]

3. Solve \( -5x + 6y = 2 \).

4. If \( \sin \theta = \frac{\sqrt{3}}{2} \) and \( \tan \theta > 0 \), \( \cos \theta = ? \)

5. For \( f(x) = x^2 - 2x \), find \( f(a+3) \).

6. For \( \sin \theta = \frac{\sqrt{3}}{2} \) and \( \cos \theta > 0 \), \( \cot \theta = ? \)

7. \( \log_2 2 = ? \)

8. Solve \( x^2 + 7x = 44 \).

9. Solve \( \sqrt{3x-1} = 12 \)

10. What is the domain of the function \( f(x) = \sqrt{x-4} \) ?

COLLEGE ALGEBRA
Part II:

1. Simplify \( (3x^4y^{-3})^{-3} \) a) \( 3x \) b) \( \frac{y^9}{27x^{12}} \) c) \( \frac{27y^9}{x^{12}} \) d) \( \frac{27x^{12}}{y^9} \)

2. What is the equation of the line with slope \( \frac{2}{3} \) that contains the point \((6,1)\)? a) \( y = \frac{2}{3}x - 5 \) b) \( y = \frac{4}{3}x + 5 \) c) \( y = \frac{2}{3}x \) d) \( y = \frac{4}{3}x - 3 \)

3. Solve the system of equations.
\[ x + y = 6 \]
\[ 3x - 2y = -2 \]

a) \((-3.3, -4)\) b) \((1,5)\) c) \((2, 4)\) d) \((0, 6)\)

4. If \( \cos \theta = \frac{\sqrt{3}}{2} \), and \( 0 < \theta < \pi \), \( \csc \theta = ? \)

a) 2 b) -2 c) \( \frac{1}{\sqrt{3}} \) d) -1
5. For \( f(x) = 3x^2 - x \), find \( f(b - 1) \).
   a) \( 3x^2 - x \)  b) \( 3x^2 - x \)  c) \( 3b^2 - b - 2 \)  d) \( 3b^2 - 7b + 2 \)

6. If \( \sec \theta = 5/4 \), and \( \sin \theta < 0 \), \( \tan \theta = ? \)
   a) \( -\frac{\sqrt{4}}{5} \)  b) \( 3/5 \)  c) \( -\sqrt{2} \)  d) \( 1/4 \)

7. \( \log_{4} \frac{1}{64} = ? \)
   a) \( -0.23 \)  b) \( -3 \)  c) \( 1/3 \)  d) \( -1/3 \)

8. Solve \( (x + 3)(x - 10) = -12 \).
   a) \( \{-3, 10\} \)  b) \( \{-15, -2\} \)  c) \( \{6\} \)  d) \( \{-2, 9\} \)

9. Solve \( \frac{-10}{x^2 - 2x - 8} + \frac{5}{x + 2} = 3 \)
   a) \( \{2/3, 3\} \)  b) \( \{-4, -2\} \)  c) \( \{-3/2, -3\} \)  d) \( \{2, 4\} \)

10. What is the domain of the function \( g(x) = \ln (x + 1) \)?
    a) \( x > 0 \)  b) \( x < 0 \)  c) \( x > -1 \)  d) \( x \geq -1 \)

Note: There is only one right answer, but there may be several ways to get there. One way is given below.

**Solutions to College Algebra Part I:**

1. Raise each factor inside the parentheses to the exponent, then simplify any remaining negative exponents.
   \[
   \frac{a^2 b^4}{b^{-4}} \quad \text{remember} \quad \left(\frac{a}{b}\right)^n = a^n b^{-n} \quad \text{and} \quad \left(\frac{p}{q}\right)^{-n} = \left(\frac{q}{p}\right)^n
   \]

2. Use the point-slope form with \( m = \frac{1}{2} \) and \( (x_1, y_1) = (8, -1) \).
   Point-slope form
   \[ y - y_1 = m(x - x_1) \]
   \[ y - (-1) = \frac{1}{2}(x - 8) \]
   and solve for \( y \).
   \[ y + 1 = \frac{1}{2}x + 4 \]
   \[ y = \frac{1}{2}x + 3 \]

3. Multiply the first equation by 3, and add it to the second equation to eliminate the \( y \)-variables. Then substitute in one of the original equations to find \( y \).
   \[ 3(6x - 2y = 8) \]
   \[ 18x - 6y = 24 \]
   \[ -5x + 6y = 2 \]
   \[ -5(2) + 6y = 2 \]
   \[ x = 2 \]
   \[ y = 2 \]
4. Since \( \tan \theta \) is positive, sin \( \theta \) and cos \( \theta \) must have the same sign, positive because of the given sin \( \theta \) value. The angle that corresponds to \( \sin \theta = \frac{1}{2} \) is 30°, and \( \cos 30^\circ = \frac{\sqrt{3}}{2} \).

5. Replace the \( x \)'s on the right-side with \((a + 3)\) and simplify.
   \[
f(a + 3) = (a + 3)^2 - 2(a + 3)
   = a^2 + 6a + 9 - 2a - 6
   = a^2 + 4a - 3
   \]

6. Since both \( \sin \theta \) and \( \cos \theta \) are positive, \( \theta \) must be in quadrant I. The angle that corresponds to \( \sin \theta = \frac{\sqrt{3}}{2} \) in quad I is \( \pi/3 \).
   And, \( \cos \pi/3 = \frac{1}{2} \).

7. To solve a logarithm, think of it like an inverse exponential. Ask \( 8^? = 2 \). The answer is 1/3, because \( 8^{1/3} = 2 \).

8. Set the equation equal to zero so that you can factor and use the Zero-Factor Property.
   \[
   (x + 1)(x - 4) = 0
   \]
   \[
   x = -1 \quad x = 4
   \]

9. Square both sides to remove the radical, then isolate the \( x \).
   \[
   3x - 1 = 12^2
   3x = 144 + 1
   x = \frac{145}{3}
   \]

10. Because functions are defined for Real Numbers, the radicand must be non-negative. Write this as an inequality and solve for \( x \).
    \[
    x - 4 \geq 0
    x \geq 4
    \]

**Solutions to College Algebra Part II:**