1. Factor completely.

\[ x^3 - x^2 y - 9x + 9y \]

(a) \((x + 3)(x - 3)(x + y)\)
(b) \((x^2 + 9)(x - y)\)
(c) \((x + 9y)(x^2 - xy + 9)\)
(d) \((x + 3)(x - 3)(x - y)\)

Solution: d

2. Find the exact solution to the numerical expression.

\[ (4^{-2} + 3^{-1})^{-1} \]

(a) \(\frac{19}{48}\)
(b) 25
(c) \(\frac{1}{25}\)
(d) \(\frac{48}{19}\)

Solution: d

3. Solve the inequality. Express the solution in interval notation.

\[ \frac{x}{3} < \frac{20 + x}{15} \]

(a) \((-\infty, 5)\)
(b) \((5, \infty)\)
(c) \((-\infty, -2)\)
(d) \((-2, \infty)\)

Solution: a
4. Solve the equation. 
\[ \sqrt[3]{7x + 1} = -4 \]
(a) \( x = \left\{ \frac{65}{7}, -\frac{65}{7} \right\} \)
(b) \( x = \frac{65}{7} \)
(c) \( x = -\frac{65}{7} \)
(d) no real solutions
Solution: c

5. Solve for \( a \).
\[ 2(a + 3) = -3(2a - 5) \]
(a) \( a = -\frac{21}{8} \)
(b) \( a = \frac{9}{8} \)
(c) \( a = -1 \)
(d) \( a = -\frac{9}{4} \)
Solution: b

6. Subtract and simplify if possible.
\[ \frac{2}{n^2 - 9} - \frac{5}{n - 3} \]
(a) \( \frac{-13-5n}{(n-3)(n+3)} \)
(b) \( \frac{-3}{(n-3)(n+3)} \)
(c) \( \frac{-3}{n^2-n-12} \)
(d) \( \frac{17-5n}{(n-3)(n+3)} \)
Solution: a

7. A total of $4,000 is invested, part at 4\% \text{ interest} \text{ per year}, \text{ and the rest at 5\% \text{ interest} \text{ per year}. If the total yearly interest is $187.50, how much is invested at each rate?}
Solution: \$1,250 \text{ invested at 4\% \text{ interest} and $2,750 invested at 5\% \text{ interest}}

8. Find the real solutions for \( t \) in the following equation.
\[ t^{-4} - 2t^{-2} - 15 = 0 \]
Solution: \( t = \left\{ -\frac{\sqrt{5}}{5}, \frac{\sqrt{5}}{5} \right\} \)
9. A car radiator has 5 quarts of 10% antifreeze. How much should be drained and replaced with 100% antifreeze to get 5 quarts of 40% antifreeze?
Solution: \( \frac{5}{3} \) quarts

10. Solve the inequality and express the solution set in interval notation.
\[
\frac{4x - 1}{x - 1} \leq 6
\]
Solution: \([5/2, \infty)\)

11. A rectangle is 5 times as long as it is wide. Its area is 125 square feet.
(a) Write an equation to describe this situation.
Solution: \( x \cdot 5x = 125 \)
(b) Solve the equation.
Solution: \( x = \{-5, 5\} \)
(c) What are the dimensions of the rectangle?
Solution: The rectangle is 5 feet by 25 feet.

12. Find the values of \( x \) that satisfy the inequality. Express the solution in interval notation.
\[
3 \left| \frac{3x - 1}{2} \right| > 5
\]
Solution: \((-\infty, -7/9) \cup (13/9, \infty)\)