1. (5 pts) Rationalize the denominator of the following expression.

\[ \frac{\sqrt{3} + 5}{\sqrt{3} - 5} \]

ANSWER: Multiply \( \sqrt{3} + 5 \) on the numerator and denominator,

\[ \frac{(\sqrt{3} + 5) \times (\sqrt{3} + 5)}{(\sqrt{3} - 5) \times (\sqrt{3} + 5)} = \frac{(\sqrt{3} + 5)^2}{3 - 25} \]

\[ = \frac{3 + 10\sqrt{3} + 25}{3 - 25} \]

\[ = \frac{28 + 10\sqrt{3}}{-22} \]

\[ = -\frac{14 + 5\sqrt{3}}{11} \]

2. (5 pts) Perform the addition or subtraction and simplify.

\[ -\frac{1}{x} + \frac{2}{x^2 + 1} + \frac{1}{x^3 + x} \]

ANSWER: The least common denominator (LCD) among three terms \( x, x^2 + 1, x^3 + x \) is \( x^3 + x \), since \( x^3 + x = x(x^2 + 1) \). So we have the expression

\[ -\frac{1}{x} + \frac{2}{x^2 + 1} + \frac{1}{x^3 + x} = -\frac{(x^2 + 1) + 2x + 1}{x^3 + x} \]

\[ = -\frac{x^2 + 1 + 2x + 1}{x^3 + x} \]

\[ = -\frac{x^2 + 1 + 2x}{x^3 + x} \]

\[ = -\frac{x^2 + 2x}{x^3 + x} \]

\[ = \frac{x(-x + 2)}{x(x^2 + 1)} \]

\[ = \frac{-x + 2}{x^2 + 1} \]

3. (5 pts) Solve the equation.

\[ -\frac{1}{x - 3} + \frac{2}{x + 3} = \frac{9}{x^2 - 9} \]

ANSWER: Multiply \( x^2 - 9 = (x - 3)(x + 3) \) on both sides, we will have

\[ \frac{- (x + 3)(x - 3)}{x - 3} + \frac{2(x - 3)(x + 3)}{x + 3} = \frac{9(x^2 - 9)}{x^2 - 9} \]

\[ - (x + 3) + 2(x - 3) = 9 \]

\[ -x - 3 + 2x - 6 = 9 \]

\[ x - 9 = 9 \]

\[ x = 18 \]

4. (5 pts) Find the x-intercepts of the equation.

\[ y = x^2 + 4x - 32 \]

Setting \( y = 0 \), we solve the equation

\[ x^2 + 4x - 32 = 0 \]

\[ (x + 8)(x - 4) = 0 \]

Thus, \( x = -8 \) and \( x = 4 \) are the solutions. Hence, the x-intercepts are \((-8,0), (4,0)\).