1. **Solve by long division (or synthetic division):**

$$\frac{(x^6 + 25x^4 - 32x^3 + 102x - 516)}{x + 2}$$

2. **Simplify:**

$$\frac{(x+3)5x^2 - x(15x + 45)}{x^2 - 9}$$

3. **Complete the square to solve for *x*:**

$$x^2 - 12x - 12 = 0$$

4. **Use the quadratic formula to determine the values of *x*:**

$$15x^2 - 25x + \frac{15}{4} = 0$$

5. **Solve by long division:**

$$\frac{6x^5 + 27x^4 + 16x^3 + 24x + 89}{x^2 + 5x - 3}$$

***Challenge Problems***

6. **Simplify:**

$$\left(\frac{x^2 + 6x + 9}{x + 3}\right)^3 * \left(\frac{(x-4)^2}{x^3 + 3x^2 + 3x + 1}\right)$$

7. **Find the values of *x* via the quadratic formula:**

$$4x^2 - 25x + 50 = 0$$

8. **Solve for x by completing the square:**

$$x^2 - 28x + 202 = 0$$

9. **Find all values of *x*:**

$$\frac{\left(\frac{x^6 + 27x^5 + 243x^4 + 729x^3}{x^3}\right)}{x + 9} = 0$$

10. **Simplify**

$$\frac{52}{x^2 + 10} - \frac{10}{x^2 - 14x + 49} = \frac{1}{8}$$

***Extreme Challenge Problem***

11. **Find the sum (without a calculator):**

$$\sum_{n=1}^{100} n$$