Factoring Expressions and Solving Equations[1]

1. At the prompt, type the following commands and press Enter:
   ```
   clear
   syms x
   expr1 = (x-1)*(x-2)*(x-3)*(x-4)*(x-5)
   expr2 = expand(expr1)
   factor(expr2)
   solve(expr2)
   ```
   ..... This solves the equation $expr2 = 0$
   Explain what happened. What is the relationship between solving and factoring?

2. Type and enter:
   ```
   expr3 = x^4 + 3*x^3 + 3*x^2 + x + 3
   factor(expr3)
   solve(expr3)
   double(ans)
   ```
   Explain what happened. Explain why an exact, symbolic solution may not be as useful as an approximation.

3. Try to solve $expr3 - 3$ by typing the following commands:
   ```
   factor(expr3 - 3)
   solve(expr3 - 3)
   double(ans)
   ```
   Why is the answer so nice?

4. Make $expr4$ be equal to $expr1 + 1$ by typing: `expr4 = expr1 + 1`
   Try to factor $expr4$ by typing: `factor(expr4)`
   And to solve $expr4 = 0$ by typing: `solve(expr4)`
   Why do you think MATLAB produces a numerical solution (for `solve`), rather than symbolic? Hint: Is it possible in this case to give a symbolic solution? Why?

5. Prepare a brief (< 1 page) written report answering all the questions. Use complete sentences and standard mathematical notation.

The user learns basic algebraic manipulation commands and is led to consider the difference between numerical and symbolic solving techniques. The user must confront the foundational fact that a symbolic solution is not always possible.