NAME:

This homework is worth 25 points and it is due on Wednesday, November 26, at the beginning of class. **No late homework will be accepted.**

**Instructions:** Attach this question sheet to your work, making it the cover page. The answers should be on 8 1/2 × 11 sheets with the question number clearly indicated. The solutions should be in order of the question number. For credit, show all steps and label answers. Papers will be graded on clarity, neatness and organization as well as correctness.

1. a) Is \( x + 1 \) a factor of \( x^{33} + x^{18} + x^3 + 1 \)? Justify your answer.
   b) Is \( x - 1 \) a factor of \( x^{33} + x^{18} + x^3 + 1 \)? Justify your answer.

2. Find all roots of \( f(x) = x^3 - 2x^2 - 2x - 3 \) in the complex number system; then write \( f(x) \) as the product of linear factors.

3. Find a polynomial \( f(x) \) with real coefficients that satisfies the following conditions: \( f(x) \) has degree 4, 0 is a root of multiplicity 2, \( 1 - 2i \) is a root, and \( f(1) = 2 \).

4. Sketch a complete graph of \( f(x) = x^3 - 6x^2 + 10x - 4 \). Find all \( x \)-intercepts exactly (algebraically) and then check your answer using your graphing calculator. Find the coordinates of each local extremum (accurate to 2 decimal places).

5. Find the quotient and remainder when \( x^3 + 2x^2 - 5x - 6 \) is divided by \( x^2 + 5x - 1 \).

6. Find the domain of \( f(x) = \ln(x - 4) \) and sketch the graph.

7. (#61, p.407) A Native American mummy was found recently. If it has lost 26.4% of its carbon-14, approximately how long ago did the Native American die? (The half life of carbon-14 is 5730 years).
   Suggestion: To get an accurate answer, when you find the continuous decay rate keep many decimal digits.

8. (#65, p.407) a) How long will it take to triple your money if you invest $500 at a rate of 5% per year compounded annually?
   b) How long will it take at 5% compounded quarterly?

Some answers.

3) \( f(x) = \frac{1}{2}x^4 - x^3 + \frac{5}{2}x^2 \).
7) About 2534 years ago.
8) a) About 22.5 years; b) About 22.1 years.