1. (a) Give the definition of an absolute maximum of a function \( f \) on a domain \( D \).

(b) Give the definition of an absolute minimum of a function \( f \) on a domain \( D \).

(c) State the Extreme Value Theorem. Give an example of a function on a closed interval that does not attain either an absolute maximum or an absolute minimum. (You may give your function algebraically or graphically.) Does this contradict the Extreme Value Theorem? Why or why not?

(d) Prove that the function \( \sin(e^{\cos(x^2+7x^{10}+13x^9+9+\ln(x^2+1)})} \) attains both an absolute maximum and an absolute minimum on the interval \([1, 7]\). Does it attain an absolute maximum and an absolute minimum on \([-432152, -10003]\)? Why or why not?

2. Find any absolute maxima and absolute minima of the function \( f(x) = 2x^3 - 21x^2 + 60x - 17 \) on the interval \([0, 3]\).

3. (a) Is it true that if \( f'(c) = 0 \) for some \( c \) in the domain of \( f \), then \( f \) has a local maximum or local minimum at \( c \)? If it is true, prove it; if not, give a counterexample.

(b) How is whether \( f \) is increasing or decreasing related to \( f'' \)?

4. Let \( f(x) = x^3 - 3x^2 - 9x + 4 \).

(a) Find the intervals on which \( f \) is increasing or decreasing.

(b) Find the local maximum and minimum values of \( f \).

(c) Find the intervals of concavity and the inflection points.

5. Find the local maximum and minimum values of \( f(x) = \frac{x^2}{x - 1} \) using both the First and Second Derivative Tests.

6. Compute the values of \( \sinh(\ln(7)) \) and \( \cosh(\ln(9)) \).

7. (a) Show that the derivative of \( \sinh(x) \) is \( \cosh(x) \).

(b) Show that the derivative of \( \cosh(x) \) is \( \sinh(x) \).

(c) Find the derivative of \( g(u) = e^{\cosh(7u)} \sinh(u^2) \).

8. Find an expression for \( \sinh^{-1}(x) \), the inverse function of \( \sinh(x) \).