1. (a) Determine the critical points of the function \( f(x) = e^{-x}(3x^2 + 2x - 2) \).

(b) For each value of \( x \) that you found in part (a), state whether there is a local maximum or local minimum or neither occurring on the function. Show how you got your answer by evaluating the derivative using a number line.

(c) What is the exact range of this function on \([-1, 4]\)? (No decimals please.)

2. Graph the function \( f(x) = -2x^3 + 5x^2 + 4x - 1 \) labeling points where the function has any local maximum or local minimum values and change in concavity. (Attach graph on another sheet of paper.)

3. Use Newton’s Method (once) to approximate a root to the function \( f(x) = 5x^3 - 7x^2 + 9x - 41 \) with \( x_0 = 2 \).

4. Determine the point(s) on the hyperbola \( x^2 - 2y^2 = 1 \) closest to the point \((0, 4)\).
5. A rectangular open box is to be constructed having the width of the base 3 times longer than the length of the base and the box is to have a total volume of 144 ft$^3$. Determine the dimensions of such a box which uses the least amount of material.

6. Given the graph ($f'(x)$) of the derivative of $f(x)$ below, answer the following questions:

(a) On which intervals is $f(x)$ increasing?

(b) On which intervals is $f(x)$ decreasing?

(c) Determine the critical points of the function and characterize each one.

(d) Determine the values of $x$ for which $f(x)$ changes concavity.

(e) Sketch a possible graph for the function $f(x)$. (Attach graph on separate sheet along with graph of question (2).)