1. Consider the function \( f(x) = x^3 - 6x^2 + 10 \) on the interval \([-1, 7]\).

(a) Calculate \( f'(x) \), and use this to find all the critical points of \( f(x) \).

(b) Calculate \( f''(x) \), and use this to find regions where \( f(x) \) is concave up or concave down.

(c) For each critical point, determine if \( f(x) \) has a local maximum or a local minimum there. Justify your answer using the first or second derivative test.

(d) Use the information found above to sketch a graph of the function \( f(x) \) on the interval \([-1, 7]\). Indicate where any local maxima, local minima, global maxima, or global minima occur.
2. (Adler, section 3.3 number 46). Find the maximal harvest from a population following the discrete-time dynamical system

\[ N_{t+1} = 1.5N_t(1 - N_t) - hN_t. \]

(a) Find the equilibrium population as a function of \( h \). What is the largest \( h \) consistent with a positive equilibrium?

(b) Find the equilibrium harvest as a function of \( h \).

(c) Find the harvesting effort that maximizes harvest.

(d) Find the maximum harvest.