Mock Midterm 2A

Note: The problems on this mock midterm have not necessarily been selected to allow them to be easy to work without a calculator. The problems on the real midterm will not require the use of a calculator.

(1) A manufacturer has been selling flashlights at $6 apiece, and at this price, consumers have been buying 3000 flashlights per month. The manufacturer wishes to raise the price and estimates that for each $1 increase in the price, 1000 fewer flashlights will be sold each month. The manufacturer can produce the flashlights at a cost of $4 per flashlight. At what price should the manufacturer sell the flashlights to generate the greatest possible profit?

(2) Find all points on the \( xy = 16y^2 + x \) where the tangent line is horizontal.

(3) Given \( h(x) = 3x^4 - 4x^2 + 3 \),
   (a) Identify any asymptotes for \( h(x) \).
   (b) Find and classify all critical points of \( h(x) \).
   (c) Find the inflection points and intervals of concavity for \( h(x) \).
   (d) Sketch a graph of \( h(x) \). Be sure to include all important features of the graph.

(4) Find an equation of the line that is tangent to the graph of \( f(x) = (x^2 - 3)^5(2x - 1)^3 \) at \( x = 2 \).

(5) An art gallery offers 50 prints by a famous artist. If each print in the limited edition is priced at \( p \) dollars, it is expected that \( q = 500 - 2p \) prints will be sold.
   (a) What limitations are there on the possible range of the price \( p \)?
   (b) Find the elasticity of demand. Determine the values of \( p \) for which the demand is elastic, inelastic, and of unit elasticity.
   (c) Interpret the results of part (1) in terms of the behavior of the total revenue as a function of unit price \( p \).
   (d) If you were the owner of the gallery, what price would you charge for each print? Explain the reasoning behind your decision.