Note: Exam 3 covers the following sections: 3.3 – 3.5 and 4.3 – 4.5

Disclaimer: This review is intended as a guide for a review of the Exam 3 material. The exam may not look like this review!!

1. (Section 3.3) Analytically find the intervals on which the graph of the function
   \[ f(x) = \frac{x^2 + 4}{4 - x^2} \]
   is concave upward and those on which it is concave downward. Then find the points of inflection of the graph.

2. (Section 3.3) Find the amount of money that should be spent on advertising in order to reach the point of diminishing returns for a manufacturing process modeled by the equation
   \[ R = \frac{1}{15000}(400x^2 - x^3), \quad 0 \leq x \leq 400 \]
   where \( R \) is the revenue (in thousands of dollars) from sales and \( x \) is the advertising cost (in thousands of dollars).

3. (Section 3.4) The manager of a department store wants to build a 600-square-foot rectangular enclosure on the store’s parking lot in order to display some equipment. Three sides of the enclosure will be built of redwood fencing, at a cost of $14 per running foot. The fourth side will be built of cement blocks, at a cost of $28 per running foot. Find the dimensions of the enclosure that will minimize the total cost of the building materials.

4. (Section 3.5) Suppose that, on a certain route, an airline carries 8000 passengers per month, each paying $50. The airline wants to increase the fare. However, the market research department estimates that for each $1 increase in fare, the airline will lose 100 passengers. Determine the price that maximizes the airline’s revenue.

5. (Sections 4.3 & 4.5) Find the derivative of each function. DO NOT SIMPLIFY!
   (a) \( y = x^3e^{\sqrt{x}} \)
   (b) \( y = 2x^{3/2} \)
   (c) \( g(t) = \ln(t^2 + 4) \)
   (d) \( f(x) = \ln(x^2\sqrt{x^2 - 1}) \)

6. (Section 4.4) After \( t \) years, the value \( V \) of a car purchased for $20,000 is given by \( V = 20,000(0.75)^t \). After how many years will the car be worth $5000?

7. (Section 4.4) Solve the equation \( \ln x + \ln(x - 3) = 0 \) for \( x \).

8. (Sections 3.5 & 4.5) The cost of producing \( x \) units of a product is modeled by \( C = 400 + 250x - 450 \ln x, \quad x \geq 1 \). Analytically find the minimum average cost.

GOOD LUCK!!!!