

Directions: Work all problems in the assignment. If you need more room use the back of the page to complete the problem.

Section 3.1

Problem 16. Compute the critical numbers and the open intervals on which the function is increasing or decreasing. Sketch the graph of the function.

$$y = (x - 2)^3$$

Problem 32. Find the critical numbers and the open intervals on which the function is increasing or decreasing. Check for discontinuities and sketch the graph.

$$y = \begin{cases} 2x + 1, & x \leq -1 \\ x^2 - 2, & x > -1 \end{cases}$$

Problem 40. **Profit:** The profit P made by a cinema from selling x bags of popcorn can be modeled by

$$P = 2.36x - \frac{x^2}{25,000} - 3500$$

for $0 \leq x \leq 50,000$.

- (a) Find the intervals on which the model function is increasing or decreasing.
- (b) If you owned the cinema what price would you charge to obtain a maximum profit for selling popcorn? Explain your answer.

Section 3.2

Problem 12. Find the relative extrema of the following function.

$$f(x) = x^4 - 12x^3$$

Problem 20. Find the absolute extrema of the function on the given closed interval.

$$f(x) = \frac{1}{3}(2x + 5) \quad [0, 5]$$

Problem 28. Find the absolute extrema for the function below on the given closed interval. Use a graphing utility to verify your results.

$$g(t) = \frac{t^2}{t^2 + 3} \quad [-1, 1]$$

Problem 44. **Profit:** The quantity demanded x for a product is inversely proportional to the cube of the price p for $p > 1$. When the price is \$10 per unit, the quantity demanded is eight units. The initial cost is \$100 and the cost per unit is \$4. What price will yield a maximum profit?

Section 3.3

Problem 16. Find the relative extrema for the given function and use the second derivative test to verify the results when applicable.

$$f(x) = \sqrt{4 - x^2}$$

Problem 30. Find the points of inflection of the graph of the given function.

$$g(x) = x^4 - 18x^2 + 5$$

Problem 52. **Point of Diminishing Return:** Identify the point of diminishing return for the input-output function. For each function, R , is the revenue and x is the amount spend on advertising. Use a graphing utility to verify your results.

$$R = -\frac{4}{9}(x^3 - 9x^2 - 27), \quad 0 \leq x \leq 5$$

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