Final Review - Chapter 4
(Applications of Differentiation)

- Find critical numbers of a function.
- Find the absolute maximum and absolute minimum of a function on a closed interval.

Example 1: Find the absolute maximum and minimum of $f(x) = xe^{x/2}$ on $[-3, 1]$

Example 2: Find the absolute maximim and minimum of $f(x) = \frac{x}{3} - \sqrt[3]{x}$ on the interval $[-1, 8]$

- Determine where a function is increasing decreasing.
- Determine where a function is concave up and concave down.

Example 3: Given $G(x) = 5x^{2/3} - 2x^{5/3}$

(a) Find the intervals of increase/ decrease.

(b) Find the local maximum and minimum values.

(c) Find the intervals of concavity and the inflection points.

Example 4: Given $g(x) = \dfrac{x}{x^2-9}$, $g'(x) = \dfrac{-x^2-9}{(x^2-9)^2}$ and $g''(x) = \dfrac{2x^3+54x}{(x^2-9)^3}$ find the following.

(a) Determine the intervals of increase/ decrease.

(b) Find the relative maxima/ minima and indicate whether it is a maxima or minima. If there are no local exrema explain why.

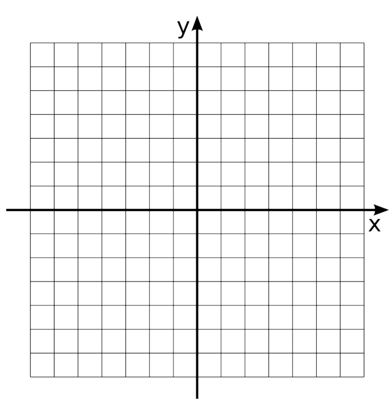
(c) Determine the intervals of concavity.

(d) Find the inflection points. If there are no inflection points, explain why.

(e) State the vertical asymptotes for $g(x)$

(f) State the horizontal asymptotes for $g(x)$

(g) Sketch the graph of $g(x)$.



- Solve max/ min optimization problems.

Example 5: A box with an open top is to be constructed from a square piece of cardboard, 3 ft wide, by cutting a square from each of the four corners and bending up the sides. Find the largest volume that such a box can have.

Example 6: Suppose a box with a square base and open top must have a volume of 32 m^3. Find the dimensions of the box that minimize the amount of material used.

Example 7: A rectangular storage container with an open top is to have a volume of 10 m^3. The length of the base is twice the width. Material for the base costs \$10 per square meter. Material for the sides costs \$ 6 per square meter. Find the costs of materials for the cheapest such container.

Suggested Probs: Ch. 4 Rvw. Pg 359 # 1, 5, 7, 9, 15, 17, 19, 27 & Pg 337 # 15, 19