UNIVERSITY OF PITTSBURGH

Summer Term 6W2 2019
Business Calculus
QUIZ III   50 Points

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Show all your work!! Partial credit will only be given for answers which are partially correct!. Be sure to include all necessary symbols. Your grade is based on the work you show and the arguments you make. **No graphing calculators. No cellphones or any other electronic device during the evaluation**.

1. (10 Pts) Find the absolute maximum and absolute minimum values of the function
   $f(x) = 2x^3 - 3x^2 - 12x + 1$ on the interval $[-2, 3]$

2. (20 Pts) A box with a square base and open top must have a volume of 32 000 cm^3. Find the dimensions of the box that minimizes the amount of material used.

3. (20 Pts) Sketch the graph of the function $f(x) = \dfrac{x}{x^2 + 9}$.

   Make sure to include in your analysis:

   (a) The domain of the function.

   (b) Intercepts.

   (c) Vertical and horizontal asymptotes.

   (d) Intervals of increase and intervals of decrease.

   (e) Critical values, extreme values.

   (f) Intervals of concavity and inflection points.

   (g) Sketch of the graph.

   To make things a little easier for you, here are the first and second derivatives.

$$f'(x) = \frac{9 - x^2}{(x^2 + 9)^2} \qquad f''(x) = \frac{2x(x^2 - 27)}{(x^2 + 9)^3}$$

Optional

4. (16 Pts) The graph of the first derivative f' of a function f is shown.

$y = f'(x)$
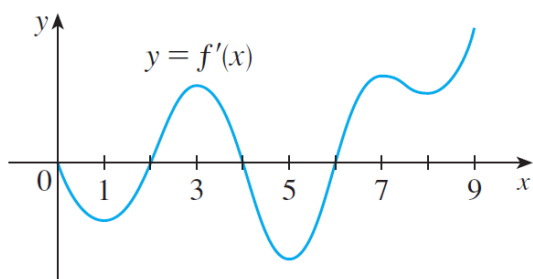
(a) On what intervals is f increasing and on what intervals is f decreasing? Explain.

(b) At what values of x does f have a local maximum or local minimum? Explain.

(c) On what intervals is f concave up or concave down? Explain.

(d) What are the x-coordinates of the inflection points of f? Why?

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