

NAME: _____

1. (Appeared on a previous final exam.) On the interval $[\frac{1}{2}, 2]$, the absolute (global) maximum and minimum for $f(x) = x^2 + \frac{1}{x}$ occur at which x values?

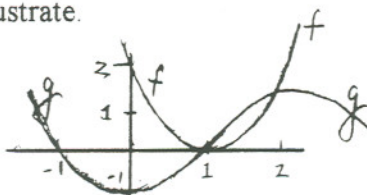
2. Graph $f(x) = xe^{-x}$ over its entire domain using information from f' and f'' .
 (a) Find exact values for all local maxima, minima, and inflection points and label them on your graph.
 (b) Find the intervals where f is increasing and decreasing.
 (c) Find the intervals where f is concave up and concave down.

3. Find: (a) $\lim_{x \rightarrow 1} \left(\frac{x^2 + 2x + 1}{x + 2} \right)$; (b) $\lim_{x \rightarrow 1} \left(\frac{\ln(x)}{x} \right)$; (c) $\lim_{x \rightarrow 1} \left(\frac{x - 1}{\ln(x)} \right)$.

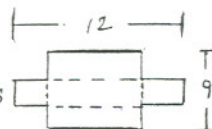
4. Find the number c guaranteed by the Mean Value Theorem for $f(x) = 1 - x^2$ on the interval $[-1, 3]$. Sketch a graph to illustrate.

5. Use the graph on the right to find

(a) $\lim_{x \rightarrow 0} \left(\frac{f(x)}{g(x)} \right)$; (b) $\lim_{x \rightarrow 1} \left(\frac{f(x)}{g(x)} \right)$.



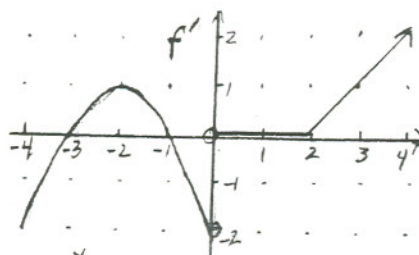
6. (Appeared on a previous final exam.) An open-top box is made from a 9 inch by 12 inch piece of cardboard by cutting out squares from each corner and folding up the sides (see figure below). What side length of the square cut out maximizes the volume of the box?



7. (Appeared on a previous final exam.) A particle moves along a line with velocity $v(t) = 4t^2$. The position at time $t = 1$ is given by $s(1) = 5$. Find a formula for the position function $s(t)$.

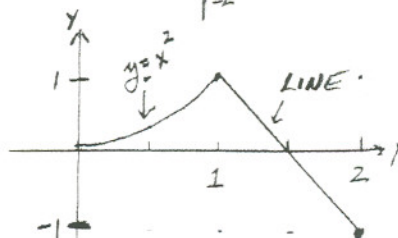
8. The graph for $y = f'(x)$ is shown on the right.

(a) Plot the graph of $y = f''(x)$.
 (b) Use the information from f' and f'' to sketch the graph of $y = f(x)$. Assume $f(0) = 0$.



9. Consider the function f graphed on the right.

(a) Find the exact value for $\int_0^2 f(x) dx$.



(b) Approximate $\int_0^2 f(x) dx$ using R_4 and show the rectangles you are using on the graph.

(c) Approximate $\int_0^2 f(x) dx$ using M_2 and show the rectangles you are using on the graph.