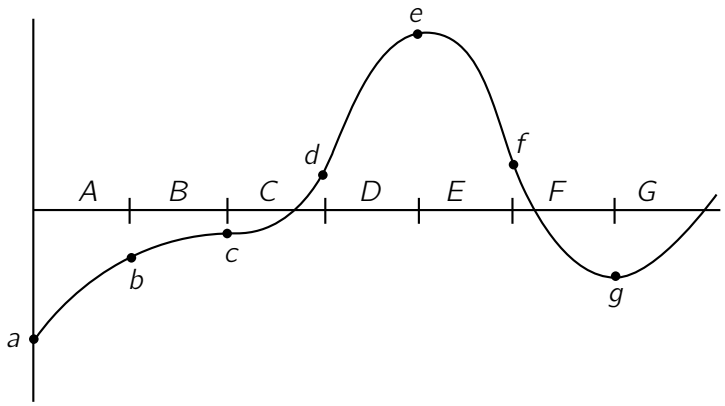
Math 180 Name: _____

Second Hour Exam

(20 pts) **1.** The graph of a function $f(x)$ is shown below:



(a) Fill in the table below with the signs of the first and second derivatives of f on each of the intervals $A, \ldots, G$.

	A	B	C	D	E	F	G
sign of f'							
sign of f''							

(b) Which of the points $a, \ldots, g$ are critical points? For each critical point, say whether it is a local maximum, a local minimum or neither.

(c) Which of the points $a, \ldots, g$ are inflection points?

(22 pts) **2.** Sketch the graph of the function $f(x) = x^{-2} - x^2$ following the steps below.

(a) Determine the domain of f and find all asymptotes.

(b) Find the intervals where the graph of f is increasing, decreasing, concave up and concave down.

(c) Sketch the graph of f, clearly showing any local extrema, inflection points, x-intercepts, y-intercepts and asymptotes.

The exam CONTINUES on the back of this page.

(20 pts) **3.** Find the area of the largest rectangle that can be inscribed in a semicircle of radius 3.

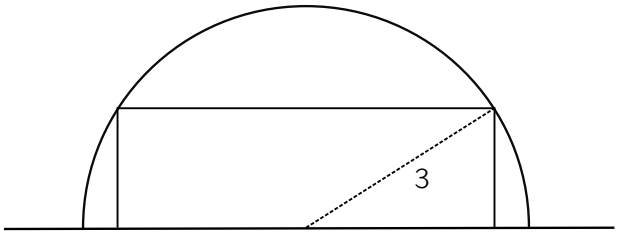


Figure 1

(18 pts) **4.** Evaluate the following limits:

(a) $\lim_{x\to 0}(\frac{1}{x} - \cot x)$

(b) $\lim_{x\to 0}(\cot x)(x^2 + 5x)$

(c) $\lim_{x\to\infty} \frac{5x^2 - 4}{3x^2 + 7x}$

(20 pts) **5.**(a) Use the tangent line approximation for the function $f(x) = \sqrt{x}$ at the point $x = 3$ to estimate the number $\sqrt{8}$.

(b) Use two steps of Newton's method beginning with $x_1 = 3$ to estimate $\sqrt{8}$, the positive root of $x^2 - 8$.

Hand in this sheet along with your exam booklet!