PRACTICE EXAM 4 - MATH 151
DATE: Friday, December 1
INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find the local and the absolute minima and maxima of the following functions in the indicated interval:

   (a) $f(x) = x - \sqrt{x}$, $\quad [0,4]$ (2.5 points)

   (b) $f(x) = \frac{x}{x^2+x+1}$, $\quad [-2,0]$ (2.5 points)

2. Find the domain, the y-intercept, the asymptotes, (1 point) form the sign table (2 points) and roughly sketch the graph (2 points) of the function $f(x) = x^3 - 6x^2 - 15x + 4$

3. Find the domain, the x- and y-intercepts, the asymptotes, (1 point) form the sign table (2 points) and roughly sketch the graph (2 points) of the function $f(x) = \frac{1}{x} + \frac{1}{x+1}$.

4. (a) Suppose that f is continuous on $[0,4]$, $f(0) = 1$ and $2 \le f'(x) \le 5$ for all x in $(0,4)$. Show that $9 \le f(4) \le 21$. (3 points)

    (b) For what values of the constants a and b is $(1,6)$ a point of inflection of the curve $y = x^3 + ax^2 + bx + 1$? (2 points)

5. Find the point on the hyperbola $xy = 8$ that is closest to the point $(3,0)$. (5 points)

6. (a) Find the most general antiderivative of the function $f(x) = e^x - \frac{2}{\sqrt{x}}$. (2 points)

    (b) A particle is moving with $a(t) = \cos t + \sin t, s(0) = 0, v(0) = 5$. Find the position function $s = s(t)$ of the particle with respect to time. (3 points)