

PRACTICE EXAM 4 - MATH 151

DATE: Friday, April 13

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) $f(x) = x - \sqrt{x}$, $[0, 4]$ (2.5 points)
 - (b) $f(x) = \frac{x}{x^2+x+1}$, $[-2, 0]$ (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 $2 \leq f'(x) \leq 5$ for all x in $(0, 4)$. Show that $9 \leq f(4) \leq 21$. (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)