FINAL EXAM, MA 125, FALL 2001

Write the answers in the space provided.

1 (10 pts) Evaluate the limit if it exists: $\lim_{x\to 21} \frac{\sqrt{x+4}-5}{x-21}$

2 (8 pts) Let $3x^2 + 11x - 7 \le h(x) \le 2x + 5$ for $-4 \le x \le 1$. Find $\lim_{x\to 1^-} h(x)$.

3 (8 pts) Find the limit $\lim_{x\to -\infty} \frac{7x^6+x^2+12}{-2x^6+21}$.

4 (8 pts) Find the one-sided limits of the difference quotient of the function $f(x) = |5x - 3|$ at $x = 3/5$. Does the derivative of $|x|$ exist at $3/5$?

5 (9 pts) Differentiate: $x^4 e^{\sin x}$

6 (9 pts) Differentiate: $\ln(x^3 e^{2x} + x^2)$

7 (10 pts) Find an equation of the tangent line to the curve at the given point: $2x^4 + y^3 = x^3 + 2y^2$; $(1, 1)$

8 (10 pts) Find local minima and maxima of the function $F(x) = \frac{e^x}{x^2+5x+7}$

9 (10 pts) Find intervals of increase or decrease, local maxima/minima, intervals of concavity and inflection points of the function $f(x) = \ln(x^2 + 2x + 5)$.

10 (10 pts) Find two positive integers such that the sum of the first number and four times the second number is 1000 and the product of the numbers is as large as possible.

11 (8 pts) Evaluate $\int_1^3 (2e^x + \sqrt{x} + 3\cos x)dx$