University of California, Riverside
Department of Mathematics

Final Exam
Mathematics 9B - First Year of Calculus
Sample 3

Instructions: This exam has a total of 140 points. You have 3 hours. You must show all your work to receive full credit. You may use any result done in class. The points attached to each problem are indicated beside the problem. You are not allowed to use books, notes, or calculators. Answers should be written as $\sqrt{2}$ as opposed to 1.4142135....

1. Find the limits:

    (a) (10 points) $\lim_{x \to 0} \frac{\ln(\cos x)}{\sin x}$

    (b) (10 points) $\lim_{x \to \infty} x \ln \frac{x+2}{x+1}$

2. Evaluate the integrals:

    (a) (10 points) $\int \frac{\ln x}{x^4} dx$

    (b) (10 points) $\int x^2 \cos(3x)\, dx$

3. Evaluate the integrals:

    (a) (10 points) $\int \frac{x+5}{x^2+4x+3} dx$

    (b) (10 points) $\int \frac{x-6}{x^2(x23)} dx$

4. Evaluate the integrals:

    (a) (10 points) $\int_0^\infty x e^{-x} dx$

    (b) (10 points) $\int_1^4 \frac{dx}{\sqrt{4-x}}$

5. Find y'. Do **not** simplify your answers!

(a) (10 points) $y = \ln |\tan x + \sec x|$

(b) (10 points) $y = \left[\sin^{-1}\left(x^2 + 1\right)\right]^5$

6. (20 points) Let S be the region bounded by the graphs of $y = x^2$ and $y = -x^2 + 2x + 4$. Find the area of S.

7. (20 points) Let S be the region bounded by $y = x^3$, the x-axis and $x = 2$. Find the volume of the solid obtained by revolving S about the line $x = -1$.