Calculus IIA
Sample Midterm 1
February 16, 2000
Professor Henry Pinkham

1. (10 pts) Write down the formula for the arc length of a curve $y = f(x)$ between $x = a$ and $x = b$. Compute the arc length of $y = \sqrt{9 - x^2}$, $-3 \leq x \leq 3$.

2. (10 pts) Write down the formula for the surface area of the surface obtained by rotating the curve $y = f(x)$ between $x = a$ and $x = b$. You may assume $f(x)$ is positive on the interval. Compute the surface area for the same example as in problem 1).

3. (10 pts) Evaluate the following two definite integrals:
a) $\int_0^4 \frac{1}{\sqrt{x^2+9}} dx$
b) $\int_0^4 \frac{x}{\sqrt{x^2+9}} dx$

4. (10 pts) Evaluate the following two definite integrals:
a) $\int_0^\pi \sin^2 \theta d\theta$
b) $\int_0^\pi \cos^3 \theta d\theta$

5. (10 pts each part) Evaluate the following definite integrals:
a) $\int_0^1 xe^x dx$
b) $\int_0^1 \arctan x dx$
c) $\int_0^1 \frac{t^3 dt}{(t+1)(t^2+1)}$
d) $\int_{-\infty}^{\infty} \frac{dx}{x^2+9}$
e) $\int_0^1 \frac{2dx}{\sqrt{x}}$

6. (10 pts) Does the integral $\int_1^\infty \frac{\sin x}{\sqrt{x^3+2}} dx$ converge or diverge? Justify your answer.