## MATH 181, Exam II

(30) **1.** Compute the following integrals.

a) 
$$\int \sin^2(2x) dx$$
  
b) 
$$\int \frac{2x-3}{x^2+2x+5} dx$$
  
c) 
$$\int xe^{-2x} dx$$

(20) **2.** Use the method of Trigonometric Substitution to compute  $\int \frac{x^3}{\sqrt{9-x^2}} dx$ .

(20) **3.** Compute

$$\lim_{n \to \infty} \left( 1 - \frac{3}{n} \right)^n.$$

(10) 4. For what values of p does the Limit Comparison Test reveal that

$$\sum_{n=1}^{\infty} \frac{\ln n}{n^{8/7}}$$

converges by comparison with 
$$\sum_{n=1}^{\infty} \frac{1}{n^p}$$
?

(10) 5. Fill in the boxes to make the inequalities true with definite integrals on the right over the smallest interval with integer endpoints possible. Draw a figure to illustrate the inequality in each case.

a) 
$$\sum_{n=5}^{N} \frac{1}{n} > \int \frac{1}{x} dx$$
  
b) 
$$\sum_{n=5}^{N} \frac{1}{n} < \int \frac{1}{x} dx$$

Explain how to use one of the inequalities to prove that  $\sum_{n=5}^{\infty} \frac{1}{n}$  diverges.

(10) 6. Explain the difference between absolute and conditional convergence of a series. Give an example of a series that converges conditionally.