Homework 9 - Math 142, Frank Thorne (thornef@mailbox.sc.edu)

(Revised version): Due Monday, November 3

(a) Read Chapter 17 of Thompson, and describe his treatment of integration. Address the following questions:

(i) What is Thompson's justification that $\int dx = x$? (See also p. 39).

(ii) What is the purpose of Thompson's example on pp. 193-194?

(iii) How does Thompson explain how to integrate $\frac{x}{5}$ on pp. 195-196?

(b) Explain what sigma notation means and how to use it.

(c) What is a geometric series? When does it converge, and if so, to what?

(d) Derive the formula for the sum of a geometric series.

(e) 11.2, 11-14, 21-24, 35-36, 47, 58, 64, 65.

(f) What is the integral test? Explain why it works.

(g) 11.3, 11-20. In addition:

- For each series which diverges, if you use the integral test, then draw a graph which represents both the series and the integral you're comparing it to.
- For each series which converges, give upper and lower bounds on the value of your series which are guaranteed to be accurate within 0.01. Draw a graph which represents your lower bound.
- Note that answers such as

$$1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \cdots + \frac{1}{99\sqrt{99}} + \frac{1}{20} < \sum_{n=1}^{\infty} a(n),$$

$$1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \cdots + \frac{1}{99\sqrt{99}} + \frac{1}{100\sqrt{100}} + \frac{1}{20} > \sum_{n=1}^{\infty} a(n)$$

are acceptable and expected. It will often be impractical to simplify the expressions you get. (But if you get something easy, then please simplify it.)

Additional problems: 11.2, 25-32, 11.3, 23-26 (Same instructions as above).

Bonus: Do 11.3, 22 subject to the instructions above. What is unusual about this computation?