MATH 114 – MAPLE ASSIGNMENT 3 – DUE 26 JULY 2007

Answer all of the following questions. You may work in groups of no more than three persons to complete this assignment. One copy of the completed assignment is to be turned in for each group. Each member of the group must sign the assignment.

You are expected to turn in a printout of a MAPLE worksheet containing the MAPLE commands and output that you used to complete the assignment. You must also include text explaining what you are doing (this can be typed onto the MAPLE worksheet or written by hand on the printout). Include any hand calculations.

This assignment is due at the beginning of class on Thursday, July 26, 2007. No late assignments will be accepted under any circumstances whatsoever. If you are not finished with the assignment by the due date, you should turn in what you have for partial credit. You may turn in the assignment early if you wish.

1. Consider the function $f(x) = \dfrac{x^2+3x+1}{(x^2+x)^{7/4}}$.

   (a) (5 pts.) Find a number $p > 0$ such that the function $g(x) = \dfrac{1}{x^p}$ satisfies $\lim_{x\to\infty} \dfrac{f(x)}{g(x)} = 1$. Use the MAPLE `limit` command to verify your choice of p. Does the value of p you found indicate that the improper integral $\int_1^\infty f(x)\,dx$ will converge or diverge? Explain. (Hint: Use the Limit Comparison Test on p. 612 of the book.)

   (b) (5 pts.) Use MAPLE to compute the value of the integral $\int_1^\infty f(x)\,dx$ accurate to 10 decimal places.

2. Consider the series $\sum_{n=1}^{\infty} a_n = \sum_{n=1}^{\infty} \dfrac{n^2+3n+1}{(n^2+n)^{7/4}}$.

   (a) (5 pts.) Find a number $p > 0$ such that the sequence $b_n = \dfrac{1}{n^p}$ satisfies $\lim_{x\to\infty} \dfrac{a_n}{b_n} = 1$ (where $a_n = \dfrac{n^2+3n+1}{(n^2+n)^{7/4}}$). Does the value of p you found indicate that the series will converge or diverge? Explain. (Hint: Use the Limit Comparison Test on p. 762 of the book.)

   (b) (5 pts.) Use MAPLE to find the limit of the sequence of partial sums as n goes to infinity, accurate to 10 decimal places.