MATH 141H Sample Exam 3

1. Determine whether the following converges or diverges. Explain how you obtain your answer.

$$\sum_{n=2}^{\infty} \frac{(2n)!}{2^n (n!)^2}.$$

2. For what real values of x does

$$\sum_{n=1}^{\infty} \frac{x^n}{\sqrt{n}}$$

converge?

3. Give the Taylor series (around $a = 0$) through the x^{14} term for

$$f(x) = x^2 e^{x^3}.$$

4. Use a Taylor series to evaluate $\cos(.1)$ with an error of less than .0001

5. (a) Show that the series

$$\pi - \frac{\pi^3}{3!} + \frac{\pi^5}{5!} - \frac{\pi^7}{7!} + \cdots$$

converges.

(b) Find the sum (not a numerical approximation) of the series in part (a).

6. (a) Write $4e^{i\pi/3}$ in the form $x + iy$, with x, y real numbers.

(b) Write $(3 + 2i)/(4 + 5i)$ in the form $u + iv$, with u, v real numbers.