Homework Set 21

(sect 8.8: Applications of Taylor Polynomials)

For questions 1 – 2, (a) approximate f by a Taylor polynomial with degree n at the number a and (b) use Taylor's Formula to estimate the accuracy of the approximation $f(x) \approx T_n(x)$ when x is in the given interval.

1. $f(x) = 1/x,\ a = 1,\ n = 3,\ 0.8 \le x \le 1.2$

2. $f(x) = \cos x\,,\ a = \pi/3,\ n = 4,\ 0 \le x \le 2\pi/3$

3. Use the information from question 2 to estimate $\cos 69°$ correct to 5 decimal places.

4. Use Taylor's Formula to determine the number of terms of the Maclaurin series for e^x that should be used to estimate $e^{0.1}$ to within 0.00001.

5. Suppose you know that $f^{(n)}(4) = \frac{(-1)^n n!}{3^n(n+1)}$ and the Taylor series of f centered at 4 converges to $f(x)$ for all x in the interval of convergence. Show that the fifth-degree Taylor polynomial approximates $f(5)$ with error less than 0.0002.