**Homework 13 - Math 142, Frank Thorne (thornef@mailbox.sc.edu)**

**Due Friday, December 5**

(a) What is a Taylor series? Why is the formula for it true?

(b) Find the Maclaurin (Taylor) series for the following functions. Determine their radii of convergence.

- $f(x) = x^2$
- $f(x) = e^x$
- $f(x) = e^{2x}$
- $f(x) = \cos(x)$
- $f(x) = \sin(x)$
- $f(x) = \cos(4x)$
- $f(x) = \sin(x^2)$
- $f(x) = x^3 \sin(x)$.
- $f(x) = x + e^x$.

(c) Explain why the Taylor series for $e^x$ gives you a formula for $e$.

(d) Compute $e$, as a fraction or decimal, to fairly good accuracy. Your estimate should plausibly be within $\frac{1}{10}$, but you don't need to show this.

(e) Compute $1/e$, as a fraction or decimal, to fairly good accuracy. Your estimate should plausibly be within $\frac{1}{100}$, but you don't need to show this.

(f) Compute $\sin(1/10)$, as a fraction or decimal, to fairly good accuracy. Your estimate should plausibly be within $\frac{1}{100}$,

(g) Compute $\sqrt{1.1}$, as a fraction or decimal, to fairly good accuracy. Your estimate should plausibly be within $\frac{1}{1000}$, but you don't need to show this.

(h) Stewart, 11.10, 29, 30.

Additional problems:

(a) Stewart, 11.10, 15, 16, 31-36.

Bonus: Use Taylor series to explain why $e^{ix} = \cos(x) + i\sin(x)$.