

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

Due Friday, December 5

- (a) What is a power series?
- (b) Describe an example of a power series which converges for all values of x .
- (c) Describe an example of a power series which converges only for some values of x .
- (d) Are there any power series which converge for no values of x ?
- (e) What is the radius of convergence of a power series? How do you find it?
- (f) 11.8, 5-18. However, you do not have to test the endpoints of the interval for convergence.
- (g) What is a Taylor series? Why is the formula for it true?
- (h) Find the Maclaurin (Taylor) series for the following functions. Determine their radii of convergence.
 - $f(x) = x^2$
 - $f(x) = e^x$
 - $f(x) = e^{2x}$
 - $f(x) = \cos(x)$
 - $f(x) = \sin(x)$
 - $f(x) = \cos(4x)$
 - $f(x) = \sin(x^2)$
 - $f(x) = x^3 \sin(x)$.
 - $f(x) = x + e^x$.
- (i) Explain why the Taylor series for e^x gives you a formula for e .
- (j) 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.
- (k) 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.
- (l) Compute $\sin(1/10)$, as a fraction or decimal, to fairly good accuracy. Your estimate should plausibly be within $\frac{1}{100}$,
- (m) 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.
- (n) Stewart, 11.10, 29, 30.

Additional problems:

(a) Stewart, 11.8, 19-24, 11.10, 15, 16, 31-36.

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

That's all folks!