

Warm-up Problems - March 27, 2006

Known Taylor series:

$$\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots = \sum_{n=0}^{\infty} x^n$$

$$e^x = 1 + x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \frac{1}{4!}x^4 = \sum_{n=0}^{\infty} \frac{1}{n!}x^n$$

1. Using the Taylor series above, find the Taylor series for the functions below.

(a)

$$\frac{1}{1+x} =$$

(b)

$$\frac{1}{1+x^3} =$$

(c)

$$\frac{x^2}{1+x^3} =$$

(d)

$$e^{-x^2} =$$

(e)

$$x(e^x - 1) =$$

(f)

$$\frac{1}{4-x} =$$

Hint: factor a 4 out of the denominator.

(g)

$$\frac{x}{2+x^2} =$$

Hint: factor a 2 out of the denominator.

Lecture Problems

2. For the functions below,

- Find the Taylor series
- Find $p_2(1)$
- Find an estimate for $|R_2(1)|$ using the Taylor's remainder formula.
- Find n so that $|R_n(1)| < 0.1$.

(a) $f(x) = e^x$

(b) $f(x) = e^{3x}$