Math 112
Quiz 9
Wednesday, April 30, 2008

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1. Find the Maclaurin series for $f(x) = e^{5x}$.
   Solution.

$$\begin{aligned} e^{5x} &= \sum_{k=0}^{\infty} \frac{(5x)^k}{k!} \\ &= \sum_{k=0}^{\infty} \frac{5^k x^k}{k!} \end{aligned}$$

2. Find the Maclaurin series for $f(x) = \dfrac{\sin x}{x}$.
   Solution.

$$\begin{aligned} \frac{sinx}{x} &= \frac{1}{x} \sum_{k=0}^{\infty} \frac{(-1)^k x^{2k+1}}{(2k+1)!} \\ &= \sum_{k=0}^{\infty} \frac{(-1)^k x^{2k}}{(2k+1)!} \end{aligned}$$

3. Find the Maclaurin series for $f(x) = x^2 e^{-x}$.
   Solution.

$$\begin{aligned} x^2 e^{-x} &= x^2 \sum_{k=0}^{\infty} \frac{(-x)^k}{k!} \\ &= \sum_{k=0}^{\infty} \frac{(-1)^k x^{k+2}}{k!} \end{aligned}$$

4. Find the sum of the series $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{6^{2n}(2n)!}$.
   Solution. $\cos(\pi/6) = \sqrt{3}/2$