

## Problems for lecture 37

April 22, 2015

1. Recall the Lagrange's Remainder Theorem that for a given  $m$  and  $x \neq 0$ , there is a point  $c$  (depending on both  $m$  and  $x$ ) with  $|c| < |x|$  so that

$$f(x) - s_m(x) = \frac{f^{(m+1)}(c)}{(m+1)!} x^{m+1}.$$

- (a) Find the Taylor series for  $f(x) = \sin x$ .
- (b) Show that its Taylor series converges pointwise to  $f(x)$  on  $(-\infty, \infty)$ . As a consequence of Problem 2, Lecture 34, the convergence is uniform on any compact subset of  $(-\infty, \infty)$ .