

## Problem of the Week-4: Double Root of a Polynomial

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A real number  $a$  is called a double root of a polynomial  $p(x)$  over  $\mathbb{R}$  if  $(x - a)^2 | p(x)$ . Determine whether the polynomial  $p_n(x) = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \cdots + \frac{x^n}{n!}$  has a double root for any positive integer  $n$ .

As always, show your work, fully explain and justify your answer.

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Posting Date 10/8/14. Submit solutions to Noah Aydin, Mathematics Department, RBH 319 (e-mail or hard-copy, but hard copy submissions must include a time stamp) by 5 pm on 10/22/14.

**Hint:** Consider the derivative of the polynomial and how it relates to polynomial having a double root.