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## Problem of the Week — November 29, 2015

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Welcome back problem solvers. Who doesn't love a good series to evaluate? The following series problem is a fun one, and pay close attention Calc II students. The student who submits the first correct and thoroughly-written solution will receive a \$15 gift card to the Kenyon bookstore. More importantly, you will have earned undeniable bragging rights. Of course a good algebraic software program can evaluate this series exactly, so naturally you must prove your answer rigorously.

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**PROBLEM:** Find the exact value of  $S$ , where

$$S = \frac{1^4}{0!} + \frac{2^4}{1!} + \frac{3^4}{2!} + \frac{4^4}{3!} + \frac{5^4}{4!} + \frac{6^4}{5!} + \cdots,$$

and justify your answer completely.

Hint: Notice what happens when the Maclaurin series expansion of  $f(x) = xe^x$  is differentiated.

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Solutions accepted until 11:59 pm 12/6/15

You must submit complete solutions to Brian Jones (Hayes 303) either via email or hard copy; however, if you submit a hard copy, it must have a time-stamp (i.e. either electronic proof of time printed or a faculty signature verifying the time submitted.) Please, if you write out a solution by hand and scan, write neatly and in black ink so your work is easily readable.