

**MATH 19 RECITATION**  
**10 NOVEMBER 2016**  
**BROWN UNIVERSITY**  
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1. By calculating derivatives, find the fourth-order Taylor polynomial for  $f(x) = xe^x$  centered at  $x = 0$ .

2. Find the Taylor series representation of  $f(x) = \frac{1}{1-x}$  centered at  $x = 0$ . Multiply the resulting infinite series by  $1 - x$  (meaning distribute and collect terms); what do you get?

3. Determine the radius of convergence of each of the following series.

(a)  $\sum_{n=1}^{\infty} \frac{n!}{n^n} x^n$

(b)  $\sum_{n=1}^{\infty} (-7)^n x^n$ .

4. Find the  $n$ th order Taylor approximations of  $\sin x$ ,  $\cos x$ , and  $e^x$ . You may express your answer either in summation notation or using an ellipsis.

Substitute  $x = i\theta$  in the Taylor approximation for  $e^x$ , add the Taylor approximation for  $\cos x$  to  $i$  times the Taylor approximation for  $\sin x$ . Comment on how your answer relates to Euler's formula.