

Show all work clearly and in order. Please box your answers.

1. Use known Maclaurin series to find the first four nonzero terms of the Maclaurin series for the following.

(a)  $\frac{\sin(x)}{x}$

(Note: This is a very important function in math, physics and engineering. It is sometimes called the **sinc** or **cardinal sine** function.)

(b)  $\frac{d}{dx} \left( \frac{\sin(x) - x}{x} \right)$

(c)  $\int e^{x^4} dx$

(Note: This is similar to an example from class, which is part of a large family of curves sometimes called **Gaussian functions**, which are also extremely important in many applications.)

(d)  $\lim_{x \rightarrow 0} \frac{1 - \cos(x)}{x}$

2. Use known Maclaurin series to find the sum for the following convergent series.  
**NOTE: ALMOST NO WORK IS NEEDED HERE, JUST A QUICK ANSWER**

(a)  $\sum_{n=0}^{\infty} \frac{1}{n!}$

(b)  $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}$

(c)  $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n+1}}{(2n+1)!}$

(d)  $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!}$

(e)  $\sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n}}{4^{2n} (2n)!}$