

**Math 9C Homework 12**  
Commonly Asked Questions

1. Solution to the in-class problem: Find the Maclaurin series for

$$\int x \cos(x^3) dx.$$

We know that the Maclaurin series for  $\cos(x)$  is:

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

Since we want to consider  $\cos(x^3)$ , we plug in  $x^3$  instead of  $x$  in this formula to get

$$\cos(x^3) = \sum_{n=0}^{\infty} \frac{(-1)^n (x^3)^{2n}}{(2n)!} = \sum_{n=0}^{\infty} \frac{(-1)^n x^{6n}}{(2n)!}.$$

Multiplying by  $x$ , we get

$$x \cos(x^3) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{6n+1}}{(2n)!}.$$

Finally, we integrate to get

$$\int x \cos(x^3) = \sum_{n=0}^{\infty} \frac{(-1)^n x^{6n+2}}{(6n+2)(2n)!}.$$

2. What is meant by the degree of a Taylor polynomial?

The degree of a polynomial is the highest power of  $x$ . So, for example, the degree of

$$5x^3 + x^6 + 9x$$

is 6.