## Section 11.10 Maclaurin Series to Memorize

**Have these Maclaurin series memorized, and know when to use them**. The following Maclaurin Series may be used, without proof, in order to achieve a higher goal.

1. $\dfrac{1}{1-x} = \displaystyle\sum_{n=0}^{\infty} x^n$, with radius of convergence $R = 1$

2. $e^x = \sum_{n=0}^{\infty} \dfrac{x^n}{n!}$, with radius of convergence $R = \infty$

3. $\cos x = \sum_{n=0}^{\infty} \dfrac{(-1)^n x^{2n}}{(2n)!}$, with radius of convergence $R = \infty$

4. $\sin x = \sum_{n=0}^{\infty} \dfrac{(-1)^n x^{2n+1}}{(2n+1)!}$, with radius of convergence $R = \infty$

5. $\arctan x = \sum_{n=0}^{\infty} \dfrac{(-1)^n x^{2n+1}}{2n+1}$, with radius of convergence $R = 1$

   To be clear, with enough practice, you will learn how to manipulate the series above to achieve a different result. A few illustrations follow:

   (a) To express $g(x) = x^3 \sin(x^4)$ as a Maclaurin Series, we can state $\sin x = \sum_{n=0}^{\infty} \dfrac{(-1)^n x^{2n+1}}{(2n+1)!}$ without proof, and then manipulate this result to express $g(x)$ as a Maclaurin Series.

   (b) To express $g(x) = \ln(4 + x^3)$ as a Maclaurin Series, we can state $\dfrac{1}{1-x} = \displaystyle\sum_{n=0}^{\infty} x^n$ without proof, then manipulate this result to express $g(x)$ as a Maclaurin Series.

   (c) To express $g(x) = \dfrac{x^3}{(1-4x)^2}$ as a Maclaurin Series, we can state $\dfrac{1}{1-x} = \displaystyle\sum_{n=0}^{\infty} x^n$ without proof, then manipulate this result to express $g(x)$ as a Maclaurin Series.