

1. Starting with the fact that $e^x = 1 + x + \frac{x^2}{2} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots = \sum_{n=0}^{\infty} \frac{x^n}{n!}$, Determine the power series for $5x^2e^{-2x}$.
2. Starting with $\frac{1}{1-x} = \sum_{i=0}^{\infty} x^i$, take a derivative to find the power series, $P(x)$, for $\frac{1}{(1-x)^2}$. What is the domain of P ?
3. Take the answer you obtained from (2) above and use substitution to determine a power series, $Q(x)$, for the function $f(x) = \frac{2x^3}{(1+x^2)^2}$. What is the domain of Q ?

4. Given the function $f(x) = \ln(x^3)$, determine its Maclaurin Series.

5. Given the function $f(x) = \sin(2x)$, find it's Taylor Series around $a = \pi/4$.