1. Use the formula for the sum of a geometric series to find a power series representation for $f(x) = \frac{5}{1-2x}$.

2. Our goal is to find a power series representation for $f(x) = \frac{1+x}{1-x}$.

   (a) Find the power series for $g(x) = \frac{1}{1-x}$ and its radius of convergence.

   (b) Use part (a) to find a power series representation for $h(x) = \frac{x}{1-x}$.

   (c) We want to add the two series together to get a series representation of $f(x)$. This will be easier if both series have terms with the same power of x. Use an index shift to rewrite the series for $h(x)$ so that its terms include x^n.

   (d) Now we want to add the two series together. Try writing each series in expanded form and then writing a new series expression for the sum.

   (e) What is the radius of convergence of the final series for $\frac{1+x}{1-x}$?

3. Now let's find a power series representation for $f(x) = \frac{2x}{(1-x)^2}$.

   (a) Find a power series representation for $g(x) = \frac{1}{(1-x)^2}$.

   Hint: Use the power series for $\frac{1}{1-x}$.

   (b) Use (a) to find a power series representation for $h(x) = \frac{2x}{1-x}$.

4. Let $f(x) = \frac{1}{1+x^2}$.

   (a) Find a power series representation for $f(x)$, including the radius of convergence.

   (b) Integrate to find a power series representation for $g(x) = \arctan(x)$. Use the initial condition $g(0) = 0$ to solve for the value of the constant.

5. Find a power series representation for $g(x) = \frac{x}{9+x^2}$.

   Hint: Find a representation for $\frac{1}{1+(x^2/9)}$ first.

6. Use the antiderivative of $f(x) = \frac{1}{(x+3)^2}$ to find a power series representation of $f(x)$.

7. Use the previous problem to find a power series representation of $g(x) = \frac{x^3}{(x+3)^2}$.