Physics 3345 **Professor Scalise**
Fall 2000 **Assignment #3**

Due: Monday 18 September 2000

1. Find the Taylor Expansion of the function $f(x) = \frac{x}{1-x}$ to five terms
   (a) about $x = 0$
   (b) about $x = \frac{1}{2}$
   (c) Find the first five approximants in (a) and (b) for $f(\frac{1}{4})$, compare to the exact answer, and comment on the convergence of both expansions.
2. (a) Find the area enclosed by the Koch snowflake fractal if the original equilateral triangle has a side of length one.
   (b) Show that the perimeter of the Koch snowflake is infinite.
3. Find the Hausdorf dimension of the volume of the Menger sponge.
4. Prove/show that $\frac{\ln(a)}{\ln(b)} = \frac{\log_{10}(a)}{\log_{10}(b)} = \log_b(a)$.