Math 417 Homework 8

Due November 3

1. Problem 1, page 218 of Churchill and Brown.

2. Find the Taylor series of $\frac{1}{z}$ centered around $z = 3$. Show that this series converges for $|z - 3| < 3$.

3. For any given positive integer n, find the Laurent series for $\frac{1}{z^n(1-z)}$ on the annulus $0 < |z| < 1$ and also the domain $|z| > 1$.

4. Find the Laurent series for $\frac{2}{(z-4)(z-6)}$ on the annulus $4 < |z| < 6$ and also on the domain $|z| > 6$.

5. Find the Laurent series of the function $e^{2z^2} + e^{\frac{1}{z^2}}$ on the set $\{z : z \neq 0\}$.

6. Find the Laurent series of $\frac{e^z}{z-1}$ about $z = 1$. Why is this Laurent expansion valid for all $z \neq 1$?