1. Find the Taylor series of e^z **about** $z = 1$ and state its region of convergence.

2. Expand sinh$z$ into a Taylor series about the point $z = \pi i$ and state its region of convergence.

3. Find the Maclaurin series of $\cosh z$ by noting that $\cosh z = \cos(iz)$.

4. What is the largest circle within which the Maclaurin series for the function $\tanh z$ converges to $\tanh z$ for all z? Write the first two nonzero terms of that series.

5. Find the Talor series of $1/z^2$ about
   (a) $z = -1$
   (b) $z = 2$
   and state its region of convergence.

6. Show that when $0 < |z| < 4$,
$$\frac{1}{4z - z^2} = \frac{1}{4z} + \sum_{n=0}^{\infty} \frac{z^n}{4^{n+2}}$$

7. Show that when $z \neq 0$,
$$\frac{\sin(z^2)}{z^4} = \frac{1}{z^2} - \frac{z^2}{3!} + \frac{z^6}{5!} - \frac{z^{10}}{7!} + \dots$$

8. (a) Show that when $0 < |z - 1| < 2$,
$$\frac{z}{(z-1)(z-3)} = \frac{-1}{2(z-1)} - 3\sum_{n=0}^{\infty} \frac{(z-1)^n}{2^{n+2}}$$
   (b) Use your result in (a) to find $\displaystyle\oint_{|z-1|=1} \frac{s}{(s-1)(s-3)} ds$

9. (a) Starting with the Taylor series for e^z, find the Laurent series representation of
$$f(z) = \frac{\sinh(2z)}{z^4}$$
   for $|z| > 0$.
   (b) Use your result in (a) to find
$$\oint_{|z|=1} f(s) ds$$