Additional Problems for Section 16.1

1. Obtain the Laurent expansion for the following and give the largest annular domain in which your series is valid.

$$\frac{1}{z^4}\cos z \quad \text{expanded in powers of z}$$

2. Obtain the Laurent expansions of 1/(z+2) in the indicated regions.

   (a) An expansion valid for |z|>2

   (b) An expansion valid for |z+1|>1.

3. Expand the following functions in a Laurent Series valid in a domain whose outer radius is infinite. State the center and inner radius of the domain.

   (a) 1/(z-1) expanded in powers of z+3

   (b) 1/(z+2) expanded in powers of z-i

4. For the following function , find the Laurent series valid in an annular domain that contains the point z=2+2i. The center for the annulus is at z=1. State the domain in which each series is valid.

$$f(z) = \frac{1}{z(z-2)}$$

Additional Problems for Section 16.3

1. Using the method of Residues, evaluate the integral:

$$\oint_C \frac{1}{(z-1)^2} + \frac{i}{(z-1)} + 2(z-1) + \frac{3}{(z-4)} dz$$

where the contour C is:

a) $|z-1| = 2$
b) $|z-5| = 2$

2. Evaluate using method of residues. Use the Laurent Expansion to get compute the residue.

$$\oint_C \frac{1}{\sin z} dz$$ around $|z|=2$