

## Math 417 Homework 8

Due November 6

1. Find all isolated singularities of the functions  $\frac{1}{z^3+1}$ ,  $\frac{z^2}{1-\cos(z)}$ , and  $\frac{z}{\sin \frac{1}{z}}$ .
2. Let  $C$  be the circle  $|z| = 4$ . Use residues to determine  $\int_C \frac{1}{(z+5)(z-1)^5} dz$ .
3. Using residues at infinity, determine  $\int_{|z|=3} \frac{(z+1)^2}{z^2(z-1)} dz$
4. Let  $D$  be the rectangle with vertices  $-1 - i$ ,  $8 - i$ ,  $8 + i$ , and  $-1 + i$ . Determine  $\int_D \frac{1}{\sin(z)} dz$ .
5. Find  $\int_{|z|=1} z^8 e^{\frac{1}{z}} dz$ .