

BRAC University
MAT-215
Exercise Sheet # 5

1. Evaluate $\oint_C \frac{z^2}{2z^2 + 5z + 2} dz$ using the residue at the poles, where C is the unit circle $|z| = 1$.

2. Evaluate $\oint_C \frac{z^2 + 4}{z^3 + 2z^2 + 2z} dz$ using the residue at the poles, around the circle $|z| = 3$.

3. Evaluate $\oint_C \frac{ze^{i\pi z}}{(z^2 + 2z + 5)(z^2 + 1)^2} dz$ using the residue at the poles, where C is the upper half circle of the equation $|z| = 2$.

4. Evaluate $\frac{1}{2\pi i} \oint_C \frac{z^2 - z + 2}{z^4 + 10z^2 + 9} dz$ using the residue at the poles, around the circle C with the equation $|z| = 4$.

5. For each of the following functions locate and name the singularities in the finite z -plane and determine whether they are isolated singularities or not.

(a) $f(z) = \frac{z}{(z^2+4)^2}$; [Hint: $f(z) = \frac{z}{(z^2-(2i)^2)^2}$]

(b) $f(z) = \frac{\ln(z-2)}{(z^2+2z+4)^4}$