BRAC University
MAT-215
Practice Sheet # 5

1. Expand each of the following functions in a Taylor series about the indicated points:

(i) e^{-z} at $z=0$

(ii) $\cos z$ at $z=\dfrac{\pi}{2}$

(iii) z^3-z^2+4z-2 at $z=2$

(iv) $z\,e^{2z}$ at $z=-1$.

2. Expand $f(z)=\dfrac{z}{(z-1)(2-z)}$ in a Laurent series valid for

(i) $|z|<1$ (ii) $1<|z|<2$
(iii) $|z|>2$ (iv) $|z-1|>1$
(v) $0<|z-2|<1$.

3. Expand $f(z)=\dfrac{1}{z(z-2)}$ in a Laurent series valid for

(i) $0<|z|<2$
(ii) $|z|>2$

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

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

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

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