Homework 7

Complex Analysis, MTH 431, Spring 2014

Hand-in Problems Due: Monday May 12th 2014

Topics: Chapters 8

1. $f(z) = \dfrac{3}{5z^2} + \dfrac{3}{5^2 z} + \dfrac{3}{5^3} + \dfrac{3z}{5^4} + \dfrac{3z^2}{5^5} + \dfrac{3z^3}{5^6} + \ldots$. Compute the following integrals.
   (a) $\displaystyle\int_{|z|=2} \frac{f(z)}{z^2} dz$ (b) $\displaystyle\int_{|z|=2} \frac{f(z)}{z^3} dz$ (c) $\displaystyle\int_{|z|=2} f(z) dz$
   (d) $\displaystyle\int_{|z|=2} z\, f(z) dz$ (e) $\displaystyle\int_{|z|=2} z^2\, f(z) dz$ (f) $\displaystyle\int_{|z|=2} z^3\, f(z) dz$

2. Determine the poles and the residues at the poles.
   (a) $\dfrac{2z+1}{z^2 - z - 2}$ (b) $(\dfrac{z+1}{z-1})^2$ (c) $\dfrac{\sin z}{z^2}$ (d) $\cot z$

3. Evaluate $\displaystyle\int_\gamma \frac{2 + \sin \pi z}{z(z-1)^2} dz$ where γ is the square with verticies $\pm 3 \pm 3i$.

4. Evalaute $\displaystyle\int_{C(0,2)} \frac{dz}{z^2 \tan z}$.