Lectures 30: Examples

Goal: find Taylor and Laurent series expansions with application to computing $\int_C f(z)\,dz = 2\pi i b_1$.

Example 1: Find $\displaystyle\oint_{|z|=\epsilon} \frac{e^z}{z}\,dz$ using (1) Cauchy integral formula, (2) Laurent Series.

Example 2: Find $\displaystyle\oint_{|z|=\epsilon} \frac{\sin(z^3)}{z^4}\,dz$ using (1) Cauchy integral formula, (2) Laurent Series.

Example 3: Find $\displaystyle\oint_{|z|=\epsilon} \frac{\sin(z^3)}{z^5}\,dz$.

Example 4: Expand $f(z) = \dfrac{1}{(z-1)(z-2)}$ in

(I) $|z| < 1$, (II) $1 < |z| < 2$, (III) $2 < |z| < \infty$, (IV) $|z-4| < 2$.

Example 5: Let $f(z) = \dfrac{e^z}{1+z}$. Find Taylor series about 0.