Math 4213 - Complex Analysis

Quiz #18 - 2012.03.26

Solutions

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1. Compute the residue at $z = 2$ of the function $f(z) = \dfrac{e^z - 1}{(z-2)^2}$.

   There is a pole of order 2 at $z = 2$, so we have

$$\begin{aligned}
\text{Res}[f, 2] &= \frac{1}{(2-1)!} \lim_{z \to 2} \frac{d^{(2-1)}}{dz^{(2-1)}} (z-2)^2 \frac{e^z - 1}{(z-2)^2} \\
&= \lim_{z \to 2} \frac{d}{dz} e^z - 1 \\
&= \lim_{z \to 2} e^z \\
&= e^2
\end{aligned}$$