# Math 122B Homework 1

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## 1  Problem 1

Prove that for any positive integer $n$,

$$\operatorname{Res}_0(1 - e^{-z})^{-n} = 1$$

**Proof.**

$\square$

## 2  Problem 2

Show that Rouche's Theorem remains valid if the condition: $|f| > |g|$ on $\gamma$ is replaced by: $|f| \geq |g|$ and $f + g$ does not vanish on $\gamma$.
**Proof.**

$\square$

## 3  Problem 3

Show that the function $\sqrt{z^2 - 1}$ can be defined, and it is analytic, on the complex plane minus the closed interval $[-1, 1]$.
**Proof.**

$\square$