

Abbrevs. Let **SCC** mean “positively oriented simple-closed-contour”. For a **SCC** C , have $\overset{\circ}{C}$ be the (open) region C encloses, and let \widehat{C} mean C together with $\overset{\circ}{C}$. So \widehat{C} is $C \cup \overset{\circ}{C}$; it is automatically simply-connected and is a closed bounded set.

Prac1: Short answer. Show no work.

Write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

a Let C be radius=5 **SCC** $Sph_5(i)$. Then

$$\int_C \frac{z}{z^2 + 1} dz = \dots$$

b The **Laplacian** of a twice-differentiable fnc $h: \mathbb{R} \times \mathbb{R} \rightarrow \mathbb{R}$, is

c A subset $E \subset \mathbb{C}$ is **simply-connected** if

Prac2: Prove that all zeros of the complex $\sin()$ fnc lie on the real axis.

Prac3: Consider a domain $D \subset \mathbb{C}$ and a fnc $h: D \rightarrow \mathbb{C}$ satisfying: *Every closed contour $C \subset D$ has $\int_C h(z) dz = 0$.* Prove that h is (complex) differentiable.

Prac4: **i** State the Cauchy Integral Formula [CIF].

ii Derive the CIF using the Cauchy-Goursat thm.

Prac5: State the *Generalized* Cauchy Integral Formula.