

Extra problems on the Cauchy integral formula

1.

$$\int_{\mathcal{C}} \frac{\sin(\pi z^2) + \cos(\pi z^2) dz}{(z-1)(z+2)}$$

where \mathcal{C} is $|z| = 3$. (Ans: $4\pi i$)

2.

$$\int_{\mathcal{C}} \frac{e^{2z} dz}{(z+1)^4}$$

where \mathcal{C} is $|z+1| = 2$. (Ans: $\frac{8\pi i e^{-2}}{3}$)

3.

$$\int_{\mathcal{C}} \frac{e^{iz} dz}{z^3}$$

where \mathcal{C} is $|z| = \pi$. (Ans: $-\pi i$)

4.

$$\int_{\mathcal{C}} \frac{e^{zt} dz}{(z^2+1)}$$

where \mathcal{C} is $|z| = 3$. (Ans: $2\pi i \sin(t)$ for $t > 0$)

5.

$$\int_{\mathcal{C}} \frac{e^{zt} dz}{(z^2+1)^2}$$

where \mathcal{C} is $|z| = 3$. (Ans: $\pi i(\sin(t) - t\cos(t))$ for $t > 0$)