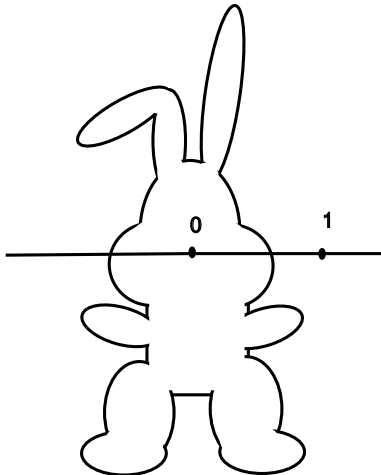


QUESTION

Find $\int_{\text{bunny}} \frac{\cos z dz}{z^2(z-1)}$, (where bunny means the boundary of the bunny below taken counterclockwise.)



ANSWER

The function $\frac{\cos z dz}{z^2(z-1)}$ has singularities at $z = 0$ and $z = 1$. Only 0 lies inside bunny. So let $f(z) = \frac{\cos z}{z-1}$ and then $\frac{f(z)}{z^2} = \frac{\cos z dz}{z^2(z-1)}$, where f is analytic within bunny and on the boundary of bunny. Thus by the Cauchy integral formula

$$\int_{\text{bunny}} \frac{\cos z dz}{z^2(z-1)} = \int_{\text{bunny}} \frac{f(z)}{z^2} = 2\pi i f'(0) = -2\pi i$$