

Practice Set – INTEGRALS, for review

In the following, let $C(a, r)$ denote a circle of center a and radius r .

1. $\int_{|z|=1} e^z \cos(z^2) dz$
2. Find $\int_{|z|=1} \frac{e^z-1}{z} dz$, $\int_{|z|=2} \frac{z}{z^2+1} dz$, $\int_{|z|=1} \frac{\cos z}{z^5} dz$, $\int_{|z|=1} \frac{1}{\sin z} dz$, $\int_{|z|=1} \frac{1}{e^z-1} dz$.
 $\int_{|z|=3} \frac{e^{-z}}{(z+2)^3} dz$, $\int_{|z|=3} \frac{\cos(\pi z)}{z^2-1} dz$,
 $\int_{|z|=r} \frac{\sin z}{z-b} dz \quad |b| \neq r$,
3. Find and classify the singularities of $\frac{e^z}{z^3}$, $\frac{1-\cos z}{z^2}$, $\frac{z}{1-\cos z}$, $\cos \frac{1}{z}$.
4. Compute residues of $\frac{1-\cos z}{z^2}$, $\frac{z^3}{(1+z)^3}$, $\frac{1}{(z^2+1)^3}$, $\frac{1}{(z^2+1)(z-1)^2}$, $\frac{e^z}{(z-1)^2}$,
 $z \exp\left(\frac{1}{1-z}\right)$ and $\frac{1}{\sin z - \cos z}$ at $z = \pi/4$
5. Find $\int_{|z|=\pi} \frac{1}{\cos^2(z)} dz$