1. C is the contour $z(t) = e^{it}$, $0 \le t \le \frac{\pi}{2}$. $f(z) = z^i$ takes the principal branch $-\pi < \theta < \pi$. Compute
$$\int_C f(z)\,dz$$

2. Let C be the circle centered at z_0 with radius R, and use the parametrization $z = z_0 + Re^{i\theta}$, $-\pi \le \theta \le \pi$ to compute
$$\int_C (z - z_0)^k\,dz$$
where $k \in \mathbb{Z}$.

3. Show that
$$\left|\int_C \frac{z+4}{z^3-1}\,dz\right| \le \frac{6\pi}{7}$$
where C is the arc of the circle $|z| = 2$ from 2 to $2i$.

4. Let C denote the line segment from i to 1. Show that
$$\left|\int_C \frac{1}{z^4}\,dz\right| \le 4\sqrt{2}$$

5. Compute $\int_C z^2\,dz$, where C is any contour from i to 3.

6. Evaluate the integral
$$\int_C e^z\,dz$$
where C is a closed contour along the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$ in counterclockwise direction.