# Cauchy's Integral Formula- HW Problems

In problems 1-6 evaluate the integrals where $C$ is the circle of radius $4$ given by $|z| = 4$.

1. $\oint_C \frac{\cos(z)}{z} dz$

2. $\oint_C \frac{\cos(z)}{z-2\pi} dz$

3. $\oint_C \frac{\cos(z)}{4z-\pi} dz$

4. $\oint_C \frac{\cos(z)}{(z-\pi)^3} dz$

5. $\oint_C \frac{e^{3z}}{(3z-1)^2} dz$

6. $\oint_C \frac{\sinh(z)}{z} dz$

In problems 7-10 evaluate the following integrals where $C$ is the square with vertices $\pi + \pi i, \ -\pi + \pi i, \ -\pi - \pi i, \ \pi - \pi i$.

7. $\oint_C \dfrac{\sin^2(z)}{6z-\pi} dz$

8. $\oint_C \dfrac{\sin(z)}{\left(z-\frac{\pi}{4}\right)^3} dz$

9. $\oint_C \dfrac{z^3}{2z-4} dz$

10. $\oint_C \dfrac{z^3}{z-4} dz$

11.  Use Cauchy's Integral theorem to determine if the following functions are analytic inside the region $D = \{z \in \mathbb{C}| \ |z| < 1\}$.

a.  $f(z) = \dfrac{\cos(3z)}{z}$

b.  $g(z) = \dfrac{e^z}{2z}$