1. Show that $\int_C f(z)\,dz = 0$ for the following functions $f$ and when $C$ is the unit circle $|z| = 1$:
   (a) $f(z) = z^3 - 1 + 3i$
   (b) $f(z) = \frac{z}{z^2 + 3}$
   (c) $f(z) = z^2 + \frac{1}{z-1}$
   (d) $f(z) = \tan z$

2. Use Cauchy’s theorem and what you know about integrals of the form $\int_C \frac{1}{(z - z_0)^n}\,dz$ to evaluate the given integrals:
   (a) $\int_C \frac{z}{z}\,dz$, where $C$ is the circle $|z| = 2$ oriented positively.
   (b) $\int_C \frac{1}{z^2}\,dz$, where $C$ is the circle $|z| = 2$ oriented positively.
   (c) $\int_C \frac{2z + 1}{z^2 + z}\,dz$, where $C$ is the circle $|z| = 2$ oriented positively.
   (d) $\int_C \frac{(z - 1)}{z(z - i)(z - 3i)}\,dz$, where $C$ is the circle $|z - i| = \frac{1}{2}$ oriented positively.
   (e) $\int_C \log(z + 10)\,dz$, where $C$ is the circle $|z| = 2$ oriented positively.

3. Evaluate $\int_C \frac{e^z}{z + 3 - 3\pi}\,dz$
   where $C$ is the unit circle $|z| = 1$ oriented positively.

4. Use Cauchy’s Formulas to evaluate the following integrals:
   (a) $\int_C \frac{4}{z - 3i}\,dz$, where $C$ is the circle $|z| = 5$ oriented positively.
   (b) $\int_C \frac{z^2 - 3z + 4i}{z + 2i}\,dz$, where $C$ is the circle $|z| = 3$ oriented positively.
   (c) $\int_C \frac{z^2}{z^2 + 4}\,dz$, where $C$ is the circle $|z - i| = 2$ oriented positively.
   (d) $\int_C \frac{\cos(2z)}{z^5}\,dz$, where $C$ is the circle $|z| = 1$ oriented positively.
   (e) $\int_C \frac{z + 2}{z^2(z - 1 - i)}\,dz$, where $C$ is the circle $|z| = 1$ oriented positively.

5. Evaluate $\int_C \frac{\sin z}{(z - 2i)^2} + \text{Re}(z)\,dz$
   where $C$ is the circle $|z| = 3$ oriented positively.