7) Evaluate $\int_C f(z)\,dz$ where C is the semicircle $z = 2e^{i\theta}$, $0 \le \theta \le \pi$

$\int_C \frac{z+2}{z}\,dz$ not analytic at $z = 0$

$\int_C f(z)\,dz = \int_0^\pi f(z(\theta))\, z'\theta\, d\theta = \int_0^\pi \left(\frac{2e^{i\theta}+2}{2e^{i\theta}}\right)(2ie^{i\theta})\,d\theta$

$\int_0^\pi 2(ie^{i\theta} + i)\,d\theta$

$2\int_0^\pi (ie^{i\theta} + 1)\,d\theta$

$2\left(e^{i\theta} + \theta \Big|_0^\pi\right) = 2\left(e^{i\pi} + i\pi - e^0 - 0\right)$

$= 2(-2 + i\pi) = \boxed{-4 + 2\pi i}$