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We will use Cauchy's integral formula here. The point $z_0 = 2$ is in the circle of radius 3, so we can use the formula. We have

$$\int_C \frac{2z^2 - z - 2}{z - z_0} dz = f(z_0) = 2\pi i g(z_0),$$

where $g(z) = 2z^2 - z - 2$ for all $z_0 \in D = \int(C)$. Then we have $f(2) = 2\pi i(2(2)^2 - 2 - 2) = 8\pi i$.

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We decompose f as $u + iv$, where u, v are real valued functions. Then we have

$$(u + iv)^2 = u - iv \implies u^2 - u - v^2 + (2uv + v)i = 0.$$

This implies that $2uv + v = 0$, thus either $v = 0$ on D or $u = \frac{-1}{2}$ on D.

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