[gex90] Definite integral via residue theorem II

(a) Evaluate the definite integral,

$$I = \int_0^{2\pi} d\theta \, \frac{\cos(3\theta)}{5 - 4\cos\theta},$$

by way of contour integration over a unit circle centered at $z \doteq e^{i\theta} = 0$ in the complex plane. Identify the (isolated) singularities of the integrand inside the unit circle and determine their residues.

(b) Check your result by using the Mathematica command Integrate for the definite integral.

Solution: