[gex16] Trigonometric relations made transparent by complex variables

(a) By using Euler's formula, $e^{\imath\phi} = \cos\phi + \imath \sin\phi$, prove the following trigonometric relations:

(i) $\sin(2\phi) = 2\sin\phi\cos\phi$,

(ii) $\cos(2\phi) = \cos^2\phi - \sin^2\phi$,

(iii) $\sin^3\phi = \frac{3}{4}\sin\phi - \frac{1}{4}\sin(3\phi)$.

(b) Use Mathematica to verify that these identities are true.

Solution: