Chapter 9, Solution 7.

If $f(\phi) = \cos\phi + j\sin\phi$,

$$\frac{df}{d\phi} = -\sin\phi + j\cos\phi = j(\cos\phi + j\sin\phi) = jf(\phi)$$

$$\frac{df}{f} = j\,d\phi$$

Integrating both sides

$$\ln f = j\phi + \ln A$$

$$f = Ae^{j\phi} = \cos\phi + j\sin\phi$$

$$f(0) = A = 1$$

i.e. $\mathbf{f(\phi) = e^{j\phi} = \cos\phi + j\sin\phi}$