04.1 com.euler   Euler's formulas

Euler's formula is our bridge back-and forth between trigonomentric forms ($\cos\theta$ and $\sin\theta$) and complex exponential form ($e^{j\theta}$):

$$e^{j\theta} = \cos\theta + j\sin\theta. \tag{1}$$

Here are a few useful identities implied by Euler's formula.

$$e^{-j\theta} = \cos\theta - j\sin\theta \tag{2a}$$

$$\cos\theta = \mathrm{Re}\left(e^{j\theta}\right) \tag{2b}$$

$$= \frac{1}{2}\left(e^{j\theta} + e^{-j\theta}\right) \tag{2c}$$

$$\sin\theta = \mathrm{Im}\left(e^{j\theta}\right) \tag{2d}$$

$$= \frac{1}{j2}\left(e^{j\theta} - e^{-j\theta}\right). \tag{2e}$$

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