ECE 1270
S 09

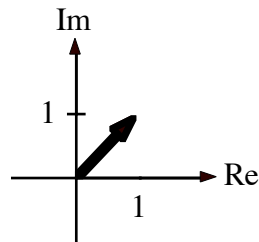**HOMEWORK #13 solution prob 2**

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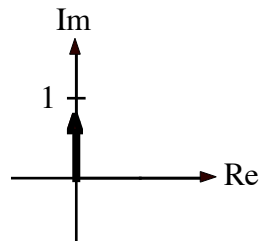**Ex:** Plot each of the following complex numbers as vectors in the complex plane:

a) $1 + j$

b) $e^{j\pi/2}$

c) $-\dfrac{1-j}{2} - \dfrac{1+j}{2}$

d) $\dfrac{1}{j^5}$

e) $\dfrac{-1+j}{1+j}$

Sol'n: a) We think of the complex numbers as vectors specified in either rectangular form, $a + jb$, or polar form, $Ae^{j\phi}$.
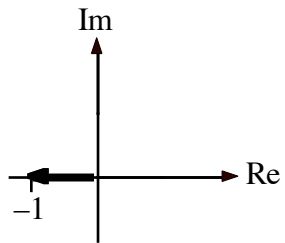

b) We use Euler's formula.

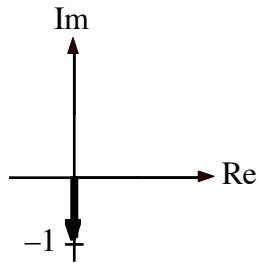$$e^{j\pi/2} = \cos(\pi/2) + j\sin(\pi/2) = 0 + j1 = j$$

c)

$$-\frac{1-j}{2} - \frac{1+j}{2} = -\frac{1}{2} + j\frac{1}{2} - \frac{1}{2} - j\frac{1}{2} = -1$$

d) Note that $j^4 = 1$, and $1/j = -j$.

$$\frac{1}{j^5} = \frac{1}{j} = -j$$

e) We can rationalize the value. We do this by multiplying the numerator and denominator by the conjugate of the denominator. $\dfrac{-1+j}{1+j}$

$$\frac{-1+j}{1+j} = \frac{-1+j}{1+j} \cdot \frac{1-j}{1-j} = \frac{-1+j2+1}{1^2+1^2} = \frac{j2}{2} = j$$