4.1 (a) If $A = 1+i$ & $B = 1-i$, what are A & B in phasor notation? Graph A & B.

(b) Calculate AB and $A+C$ using complex notation or phasor notation.

(c) If $A = 1+i$ and $B = 2-2i$, calculate the angle that $A+B$ makes with the real axis.

(d) For general A and B, prove

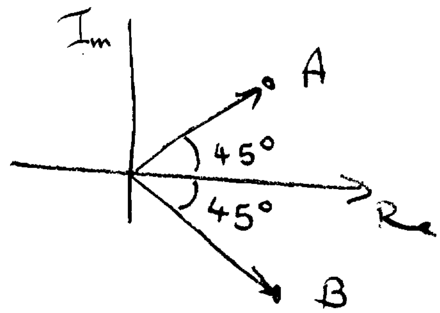
$$\cos A \cos B = \tfrac{1}{2}\left[\cos(A+B) + \cos(A-B)\right]$$

using Euler's Formula.

<u>Sol'n</u>

(a) $A = 1+i = \sqrt{2}\, e^{i\pi/4}$

$B = 1-i = \sqrt{2}\, e^{-i\pi/4}$



(b) $A+B = 1+i+1-i$

$= 2$

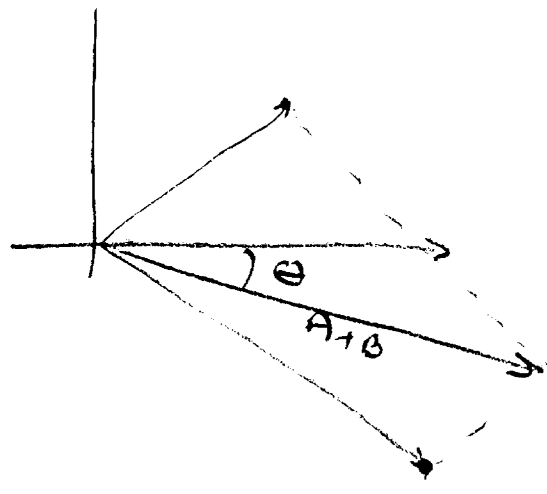
$AB = \sqrt{2}\, e^{i\pi/4}\sqrt{2}\, e^{-i\pi/4} = 2$

(also $= (1+i)(1-i) = 1-i^2 = 2$)

(c) $A = 1+i$, $B = 2-2i$

$\therefore A+B = 3-i$

$\theta = \tan^{-1}(-1/3) = -18.43°$



(d) $\cos A \cos B = \left(\frac{e^{iA} + e^{-iA}}{2}\right)\left(\frac{e^{iB} + e^{-iB}}{2}\right)$

$$= \frac{1}{4}\left[e^{i(A+B)} + e^{i(A-B)} + e^{-i(A-B)} + e^{-i(A+B)}\right]$$

$$= \frac{1}{2}\left[\frac{e^{i(A+B)} + e^{-i(A+B)}}{2} + \frac{e^{i(A-B)} + e^{-i(A-B)}}{2}\right]$$

$$= \frac{1}{2}\left[\cos(A+B) + \cos(A-B)\right]$$

QED.