Ex: Give numerical answers to each of the following questions:

a) Rationalize $\frac{120-j22}{-11+j60}$. Express your answer in rectangular form.

b) Find the polar form of $j(1+j)*e^{j30°}$. (Note the asterisk that means "conjugate".)

c) Find the following phasor: P[–7cos(49t + 135°)].

d) Find the magnitude of $\left(\frac{24+j7}{3-j4}\right)\left(\frac{-1}{e^{j10°}}\right)$.

e) Find the imaginary part of $\frac{e^{j45°}}{e^{-j225°}}$.

Soln: a) $\frac{120-j22}{-11+j60} \cdot \frac{-11-j60}{-11-j60} = \frac{2(60-j11)(-1)(11+j60)}{11^2+60^2}$

$= \frac{-2[60(11)+11(60)+j3600-j121]}{61^2}$

$= \frac{-1320-j6958}{61^2}$

$= -\frac{1320}{3721} - \frac{j6958}{3721}$

$\approx -0.355 - j1.870$

b) $j(1+j)^* e^{j30°} = j(1-j)e^{j30°}$

$= e^{j90}\sqrt{2}\,e^{-j45°}e^{j30°}$

$= \sqrt{2}\,e^{j75°}$

c) $P[-7\cos(49t + 135°)] = -7 \angle 135°$

$= 7 \angle 135° \pm 180°$

$= 7 \angle 315°$ or $7 \angle -45°$

d) $\left|\frac{24+j7}{3-j4}\right|\left|\frac{-1}{e^{j10°}}\right| = \frac{|24+j7|}{|3-j4|}\cdot\frac{|-1|}{|e^{j10°}|}$

$= \frac{\sqrt{24^2+7^2}}{\sqrt{3^2+4^2}} \cdot \frac{1}{1}$

$= \frac{25}{5}$

$= 5$

e) $\text{Im}\left[\frac{e^{j45°}}{e^{-j225°}}\right] = \text{Im}\left[e^{j(45° - -225°)}\right]$

$= \text{Im}\left[e^{j270°}\right]$

$= \text{Im}\left[-j\right]$

$= -1$