① a) $v(t) = 10\cos(120t - 225°)\ V$

$v(t) = 10\cos(120t - 225° + 360°)$

$v(t) = 10\cos(120t + 135°)\ V$

$v(t) = 10\cos(120t + 135°) + j\,10\sin(120t + 135°)\ V$

$v^*(t) = 10\,e^{j(120t + 135°)}$

$= 10\,\cancel{e^{j120t}}\,e^{j135°}$

$\hat{V} = 10\,e^{j135°}$

$$\boxed{\hat{V} = 10\angle 135°\ V}$$

① b) $i(t) = 5\sin(600t - 125°)\ A$

$$= 5\cos(600t - 125 - 90)$$

$$= 5\cos(600t - 215°)$$

$$= 5\cos(600t - 215 + 360)$$

$$= 5\cos(600t + 145°)\ A$$

$$i(t) = 5\cos(600t + 145°) + j\,5\sin(600t + 145°)\ A$$

$$i^*(t) = 5e^{j(600t + 145°)}$$

$$\hat{I} = 5\angle 145°\ A$$

① c) $v(t) = -3\sin(20t)$ V

$= -3\cos(20t - 90^\circ)$

$= 3\cos(20t - 90 + 180)$

$= 3\cos(20t + 90^\circ)$

$v(t) = 3\cos(20t + 90) + j\,3\sin(20t + 90)$

$v^*(t) = 3e^{j(20t+90)}$

$\hat{V} = 3\angle 90^\circ$ V

① d) $i(t) = -10\cos(2t + 45°)$

$i(t) = 10\cos(2t + 45 - 180)$

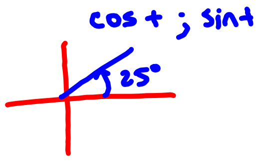
$i(t) = 10\cos(2t - 135°)$

$i(t) = 10\cos(2t - 135°) + j\,10\sin(2t - 135°)$

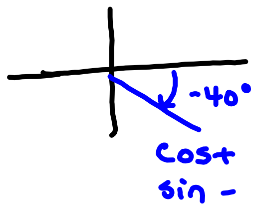
$i^*(t) = 10e^{j(2t - 135°)}$

$\hat{I} = 10\angle -135°\ A$

② a) $6\angle 25^\circ + 10\angle -40^\circ$



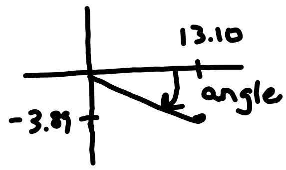
$$6\angle 25^\circ = 6\cos(25^\circ) + j6\sin(25^\circ)$$
$$= 5.44 + j\,2.54$$



$$10\angle -40^\circ = 10\cos(-40) + j\,10\sin(-40)$$
$$= 7.66 - j\,6.43 \leftarrow$$

$$(5.44 + 7.66) + j(2.54 - 6.43)$$

$$\boxed{13.10 - j\,3.89}$$



$$\text{mag} = \sqrt{13.10^2 + (-3.89)^2}$$
$$= 13.66$$

$$\text{angle} = \tan^{-1}\left(\frac{-3.89}{13.10}\right) = -16.55^\circ$$

$$\boxed{13.10 - j\,3.89} \Rightarrow \boxed{13.66\angle -16.55^\circ}$$

$$\boxed{13.66\cos(5t - 16.55^\circ)}$$

2b $(5\angle 80^\circ)(2+j4)$

$2+j4 \Rightarrow$ mag $= \sqrt{2^2+4^2} = 4.47$

angle $= \tan^{-1}\left(\frac{4}{2}\right) = 63.43^\circ$

$(5\angle 80^\circ)(4.47\angle 63.43^\circ)$

$(5)(4.47)\angle(80+63.43)$

$22.36\angle 143.43^\circ$

$22.36\cos(5t+143.43^\circ)$

2c $(-1-j8)+(6-j5) = 5-j13$

$5-j13 \Rightarrow \text{mag} = \sqrt{5^2+(-13)^2} = 13.93$

$\text{angle} = \tan^{-1}\left(\frac{-13}{5}\right) = -68.96°$

$5-j13 \Rightarrow 13.93 \angle -68.96°$

$13.93 \cos(5t - 68.96°)$

2d) $(2\angle 140^\circ) + (3 - j6)$

$\uparrow$

$2\cos(140) + j2\sin(140) + (3 - j6)$

$(-1.53 + j1.29) + (3 - j6) = 1.47 - j4.71$

$1.47 - j4.71 \Rightarrow \text{mag} = \sqrt{1.47^2 + (-4.71)^2} = 4.94$

$\text{angle} = \tan^{-1}\left(\frac{-4.71}{1.47}\right) = -72.71$

$1.47 - j4.71 \Rightarrow 4.94 \angle -72.71^\circ$

$4.94\cos(5t - 72.71^\circ)$

2e) $\frac{(-4+j3)}{2\angle 10^\circ}$

$-4+j3 \Rightarrow mag = \sqrt{-4^2 + 3^2}$
$= 5$
$angle = \tan^{-1}\left(\frac{3}{-4}\right)$
$= -143.13^\circ$
$= 5\angle -143.13^\circ$

$$\frac{5\angle -143.13^\circ}{2\angle 10^\circ} = \left(\frac{5}{2}\right)\angle(-143.13 - 10)$$
$$= 2.5\angle -153.13^\circ$$
$$2.5\cos(5t - 153.13^\circ)$$

2f $\dfrac{10\angle -25^\circ}{-2+j10}$

$-2+j10 \Rightarrow \text{mag} = \sqrt{-2^2+10^2}$

$= 10.2$

$\text{angle} = \tan^{-1}\left(\dfrac{10}{-2}\right)$

$= 101.31$

$\dfrac{10\angle -25}{10.2\angle 101.31}$

$\left(\dfrac{10}{10.2}\right)\angle(-25-101.31)$

$0.98\angle -126.31^\circ \Rightarrow 0.98\cos(5t-126.31^\circ)$