Evaluate:

1. a) $\left[\frac{\cos 60^\circ\, e^{2-j2}\, 16}{20}\right] = \left[\frac{\cos 60^\circ\, e^{2+j2}\, 16}{20}\right]$ change every j to -j

$= \frac{1}{2} e^{2} e^{j2} \cdot \frac{16}{20} = \frac{2}{5} e^{2} (\cos 2 + j \sin 2)$

b) Polar form of $\frac{2+j1.5}{4e^{j45^\circ}} = \frac{\sqrt{2^2+1.5^2}\, e^{j \tan^{-1} \frac{1.5}{2}}}{4 e^{j45^\circ}}$

$= \frac{2.5}{4} \frac{e^{j37^\circ}}{e^{j45^\circ}} = 0.625\, e^{j(37^\circ - 45^\circ)} = 0.625\, e^{-j8^\circ}$

c) Rectangular form $\frac{16 e^{j30^\circ}}{4 e^{j45^\circ}} = 4 e^{j(30^\circ - 45^\circ)} = 4 e^{-j15^\circ}$

$= 4 \cos 15^\circ - j4 \sin 15^\circ = 3.86 - j\, 1.04$

d) $\mathrm{Re}\left[\frac{j3(6-j7)}{e^{j30^\circ}}\right] = \mathrm{Re}\left[j3(6-j7)\, e^{-j30^\circ}\right] = \mathrm{Re}\left[(21+j18) e^{-j30^\circ}\right]$

$= \mathrm{Re}\left[(21+j18)(\cos 30^\circ - j \sin 30^\circ)\right] = \mathrm{Re}\left[(21+j18)\left(\frac{\sqrt{3}}{2} - j\frac{1}{2}\right)\right]$

$= \mathrm{Re}\left[\frac{21\sqrt{3}}{2} + \frac{18}{2} - j\frac{21}{2} + j\frac{18\sqrt{3}}{2}\right] = \frac{21\sqrt{3}}{2} + 9$

e) $P\left[5 \sin\left(2\pi 10^5 t - 20^\circ\right)\right] = 5 \angle -90^\circ - 20^\circ = 5 \angle -110^\circ$

↑ sin adds -90°

f) $P^{-1}\left[\frac{5 e^{j45^\circ}}{3+j4}\right] = P^{-1}\left[\frac{5 e^{j45^\circ}}{\sqrt{3^2+4^2}\, e^{j \tan^{-1} 4/3}}\right] = P^{-1}\left[\frac{5 e^{j45^\circ}}{5 e^{j53^\circ}}\right]$

$= P^{-1}\left[e^{j45^\circ - 53^\circ}\right] = P^{-1}\left[1 \angle -8^\circ\right] = 1 \cdot \cos(\omega t - 8^\circ)$

g) Abs mag of $\frac{3e^{j\frac{\pi}{2}}}{5-j12} = \left|\frac{3e^{j\frac{\pi}{2}}}{5-j12}\right| = \frac{|3e^{j\frac{\pi}{2}}|}{|5-j12|} = \frac{3}{\sqrt{5^2+12^2}} = \frac{3}{13}$

h) Rationalize $\frac{5-j4}{1-j} = \frac{5-j4}{1-j}\frac{1+j}{1+j} = \frac{5+4+j5-j4}{1^2+1^2} = \frac{9}{2} + j\frac{1}{2}$