1. a) $c = 3e^{j\pi/4} + 4e^{-j\pi/2}$

$= 3\cos\frac{\pi}{4} + 3j\sin\frac{\pi}{4} + 4\cos\left(\frac{-\pi}{2}\right) + 4j\sin\left(\frac{-\pi}{2}\right)$

$= \frac{3}{2}\sqrt{2} + j3\frac{\sqrt{2}}{2} - 4j$

$c = 2.121 - 1.878j = 2.833\,e^{-j.725}$

b) $c = (-1 + 2j)^5 = \left(2.236\,e^{2.034j}\right)^5$

$= 2.236^5\,e^{j\,10.172}$

$= 55.9\,e^{j\,10.172}$ subtr 2π off of angle

$= 55.9\,e^{j\,3.889} = -41 - 38j$

c) $c = 2e^{j\pi/2} - 3e^{j\pi/3}$

$= 2\cos\frac{\pi}{2} + 2j\sin\frac{\pi}{2} - 3\cos\frac{\pi}{3} - 3j\sin\frac{\pi}{3}$

$= 2j - \frac{3}{2} - 2.598j$

$= -1.5 - j\,0.598 = 1.615\,e^{3.521j}$

2a) $x(t) = \sin(4t) + .5\cos(4t)$

$$= \cos(4t - \pi/2) + .5\cos(4t)$$

let $\bar{x}(t) = e^{(4t - \pi/2)j} + .5e^{j4t}$

$$= e^{j4t}\left(e^{-\pi/2 j} + .5\right)$$

$$= e^{j4t}\left(-j + .5\right)$$

$$= e^{j4t}\, 1.118\, e^{-1.107j}$$

$$= 1.118\, e^{j(4t - 1.107)}$$

then

$\quad x(t) = \text{Real}(\bar{x}(t)) = 1.118\cos(4t - 1.107)$

b) $x(t) = 60\sin(120\pi t) + 120\cos(120\pi t - 20°)$

$$= 60\cos(120\pi t - 90°) + 120\cos(120\pi t - 20°)$$

let $\bar{x}(t) = 60 e^{j(120\pi t - 90°)} + 120 e^{j(120\pi t - 20°)}$

$$= e^{j120\pi t}\left(60 e^{-90°j} + 120 e^{-20°j}\right)$$

$$= e^{j120\pi t}\left(-60j + 112.8 - 41j\right)$$

$$= e^{j120\pi t}\, 151.4\, e^{-j41.8°}$$

$\bar{x}(t) = 151.4\, e^{j(120\pi t - 41.8°)}$

$x(t) = 151.4\cos(120\pi t - 41.8°)$