5. \(a = -2 + j4, \quad b = 3 - j5\)

a. \(a + b = \left[-2 + 3\right] + j\left[4 - 5\right] = 1 - j\) or \(1 + j(-1)\)

b. \(|a| = \sqrt{(-2)^2 + 4^2} = \sqrt{20} = 4.47\)

\(a = \tan^{-1}\left(\frac{4}{-2}\right) = \tan^{-1}\left(\frac{4}{2}\right) = -63.4^\circ + 180^\circ = 116.6^\circ = 2.03\text{ rad.}\)

Note: Many calculators will do rectangular to/from polar conversions directly. However, if you are calculating an angle using \(\tan^{-1}\) (as here), you must take care to adjust the answer your calculator gives you. Generally speaking, a calculator cannot distinguish between \(\tan^{-1}\left(\frac{4}{2}\right)\) and \(\tan^{-1}\left(\frac{-4}{-2}\right)\), but the angles are different.

The angle of \(-j4\) is \(-63.4^\circ\)

c. Convert \(b\) to polar: \(b = 5.83/\angle 59^\circ\)

\(a \cdot b = (4.47)(5.83) / 116.6, \angle 59^\circ = 26.1, \angle 59.6^\circ\)

Real part: \(26.1 \cos(59.6^\circ) = 14.0\)

d. Real part of \(a \cdot b = (-2)(3) + (j4)(j(-5)) = 6 + (-1)20 = 14\)
6. \(-5 \cos (400t - \pi/2)\) Amps = \(5 \cos (400t + \pi/2)\) Amps

Since \(-\cos x = \cos (x + \pi)\)

a) Amplitude: 5A (amplitude must be positive).
Frequency: \(w = 400\text{ rad/s} \Rightarrow f = \frac{400}{2\pi} = 63.7\text{ Hz}\)
Phase: \(\pi/2\text{ rad} \Rightarrow 90^\circ\)
Note: to find phase, put function in standard cosine form: \(A \cos (wt + \phi)\) with \(A\) positive.
Then phase is \(\phi\).

b) \(\cos x = \sin (x + \pi/2) \Rightarrow 5 \sin (400t + \pi)\) Amps
\(= 5 \sin (400t - \pi)\) Amps (since \(\sin (x + 2\pi) = \sin x\))
\(= 5 \sin (400t + 180^\circ)\) Amps.

7. \(3x - 5y = 7\)  
   \(6y - 8 = 4x \Rightarrow 4x - 6y = -8\)

a) Using calculator, Gaussian elimination, adjoint method, Cramer's rule, or any other method:
   \(x = -41, y = -26\)

b) \(3(-41) - 5(-26) = -123 + 130 = 7\checkmark\)
   \(6y - 8 = 6(-26) - 8 = -164 \Rightarrow 4(-41) = -164\checkmark\)

8. email

9. see syllabus

10. Thevenin
   \(6.5/22 \times 22 = 15.89\)
   \(0.82 \times 22 = 18.04\)

12. Answer: "Maybe"
    See syllabus

13-18 see syllabus