

## Echelon Form and Complex Numbers

(1) Find the equation of the quadratic

$$y = ax^2 + bx + c \quad (1)$$

which passes through  $(0, 0)$ ,  $(1, 2)$ ,  $(-1, 3)$ .

(2) Find the determinant for the following Hermitian matrix. What do you notice?

$$\begin{bmatrix} 4 & 3 - 2i & -3i \\ 3 + 2i & 1 & -5 + 2i \\ 3i & -5 - 2i & 2 \end{bmatrix} \quad (2)$$

(3) Solve the following systems of linear equations.

$$\begin{array}{rrcrcl} 3x & - & 4y & + & 7z & = & -23 \\ 5x & - & 10y & + & 11z & = & -47 \\ 5x & & & - & z & = & 7 \\ x & - & 3y & + & 2z & = & -12 \end{array} \quad (3)$$

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$$\begin{array}{rrcrcl} 2u & + & v & - & 2w & = & 4 \\ 2u & + & 4v & - & 3w & = & 9 \\ 4u & + & 5v & - & 5w & = & -11 \end{array} \quad (4)$$

(4) Represent the following complex numbers in polar form  $r(\cos \theta + i \sin \theta)$ .

$$3 + 4i \quad (5)$$

$$-1.04 - 1.56i \quad (6)$$

(5) Solve the following problems in electrical engineering.

1. The impedance  $Z$  (in  $\Omega$ ) in an alternating-current circuit is given by  $Z = 3560 / -32.4^\circ$ . Express this in rectangular form.
2. The current in a microprocessor circuit is represented by  $3.75 / 15.0^\circ \mu\text{A}$ . Write this in rectangular form.
3. The voltage of a generator is represented by  $2.84 - 1.06ik\text{V}$ . Write this voltage in polar form.

**(6)** Use complex arithmetic to provide the following in rectangular form.

$$(8i - 5)(7 + 4i) \tag{7}$$

$$(\sqrt{-18}\sqrt{-4}) \cdot 3i \tag{8}$$

$$(1 + i)(1 - i)^2 \tag{9}$$

$$\frac{0.25}{3 - \sqrt{-1}} \tag{10}$$

$$\frac{6 + 5i}{3 - 4i} \tag{11}$$

$$\frac{(2 - i^3)^4}{(i^8 - i^6)^3} + i \tag{12}$$