Sec 3.4.1
Determining the Zeros of Polynomial Functions

List the possible rational zeros- $\frac{\text{factors of the constant}}{\text{factors of the leading coefficient}}$

$f(x) = x^3 + 2x + 6$

$g(x) = -4x^3 - 3x + 10$

C → 10, 1, 5, 2

LC → 4, 1, 2

Possible → $\pm \frac{5}{2}, 10, 5, \frac{1}{4}, 1, \frac{1}{2}, \frac{5}{4}, 2,$

*this is called the rational zero theorem

Finding all zeros-

Find all zeros of $f(x) = x^3 + 2x^2 - 5x - 6$

C → $\pm 6, \pm 3, \pm 2, \pm 1$ ← possible

LC → ± 1

2	1	2	-5	-6
		2	8	6
	1	4	3	0

coefficients of quotient

$(x-2)(x^2+4x+3)=0$

$(x-2)(x+3)(x+1)=0$

$x = \{-3, -1, 2\}$

Find all zeros of $f(x) = x^3 + 7x^2 + 11x - 3$

C→ $\pm 3, 1$ ← possible

LC→ ± 1

$$\begin{array}{r|rrr} -3 & 1 & 7 & 11 & -3 \\ & & -3 & -12 & 3 \\ \hline & 1 & 4 & -1 & 0 \end{array}$$

$$(x+3)(x^2+4x-1)=0$$

$$x = \frac{-4 \pm \sqrt{16-4(-1)}}{2}$$

$$= \frac{-4 \pm \sqrt{20}}{2} \text{ ooo } 4.5$$

$$= \frac{-4 \pm 2\sqrt{5}}{2}$$

$$= -2 \pm \sqrt{5}$$

$$x = \{-3, -2+\sqrt{5}, -2-\sqrt{5}\}$$

Find all zeros of $f(x) = x^3 - 4x^2 + 8x - 5$

C → $\pm 5 \pm 1$ ← possibles

LC → ± 1

$$\begin{array}{c|ccc} 1 & 1 & -4 & 8 & -5 \\ & & 1 & -3 & 5 \\ \hline & 1 & -3 & 5 & 0 \end{array}$$

$$(x-1)(x^2-3x+5)=0$$

$$x = \frac{3 \pm \sqrt{9-4(5)}}{2}$$

$$= \frac{3 \pm \sqrt{-11}}{2} \quad \text{000-1.11}$$

$$= \left\{ \frac{3 \pm i\sqrt{11}}{2}, 1 \right\}$$


Suggested Practice
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9. a. $\pm 1, \pm 2, \pm 4$

b. $-2, -1, 2$

c. $-2, -1$ & 2

11.

a. $\pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}$

b. $-2, \frac{1}{2}, 3$

c. same

13. a. $\pm 1, \pm 2, \pm 3, \pm 6$

b. -1

c. also $\frac{-3 \pm \sqrt{33}}{2}$

15. a. $\pm 1, \pm \frac{1}{2}, \pm 2$

b. -2

c. and... $\frac{-1 \pm i}{2}$