

Quiz Polynomials

RB

[1] Factor and find all zeros:

[a]  $P(x) = x^4 - 6x^3 + 10x^2 - 8$

$$\begin{array}{r|rrrrrr} \downarrow & 1 & -6 & 10 & 0 & -8 \\ & & 1 & -5 & 5 & 5 \\ \hline & 1 & -5 & 5 & 5 & -3 \end{array}$$

$$\begin{array}{r|rrrrr} \uparrow & 1 & -6 & 10 & 0 & -8 \\ & & -1 & 7 & -17 & 17 \\ \hline & 1 & -7 & 17 & -17 & 9 \end{array}$$

$$\begin{array}{r|rrrrr} \downarrow & 1 & -6 & 10 & 0 & -8 \\ & & 2 & -8 & 4 & 8 \\ \hline & & -4 & 2 & 4 & 0 \end{array}$$

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

$$\begin{array}{r|rrrr} \downarrow & 1 & -4 & 2 & 4 \\ & & 2 & -4 & -4 \\ \hline & 1 & -2 & -2 & 0 \end{array}$$

$$(x-2)^2(x^2 - 2x - 2) = 0$$

$$\downarrow \quad x = \frac{2 \pm \sqrt{4+8}}{2}$$

$$x = 2$$

$$x = \frac{2 \pm 2\sqrt{3}}{2}$$

$$x = 1 \pm \sqrt{3}$$

[b]  $P(x) = x^3 - x^2 + 3x + 5$

$$\begin{array}{r|rrrr} \downarrow & 1 & -1 & 3 & 5 \\ & & 1 & 0 & 3 \\ \hline & 1 & 0 & 3 & 8 \end{array}$$

$$\begin{array}{r|rrrr} \uparrow & 1 & -1 & 3 & 5 \\ & & -1 & 2 & -5 \\ \hline & 1 & -2 & 5 & 0 \end{array}$$

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

↓

$$x = \frac{2 \pm \sqrt{4-20}}{2}$$

$$x = \frac{2 \pm 4i}{2}$$

$$x = 1 \pm 2i$$

$$x = -1$$

[2] Write a third-degree polynomial with the roots  $1+i$  and  $2$ .

$$\begin{aligned}x &= 1+i \\(x-1)^2 &= (i)^2 \\x^2 - 2x + 1 &= -1 \\ \underline{x^2 - 2x + 2} &= 0\end{aligned}$$

$$\begin{aligned}P(x) &= (x-2)(x^2 - 2x + 2) \\ &= x^3 - 2x^2 + 2x - 2x^2 + 4x - 4 \\ &= \underline{\underline{x^3 - 4x^2 + 6x - 4}}\end{aligned}$$

[3] Evaluate each of the following.

$$\begin{aligned}\text{[a]} (4-3i)^2 &= (4-3i)(4-3i) \quad -9 \\ &= 16 - 12i - 12i + \cancel{9i^2} \\ &= 7 - 24i\end{aligned}$$

$$\text{[b]} |3-4i| = 5$$