

## Mini Lecture 4.2

### ① Remainder Theorem

$$f(x) = x^5 - x^4 + x^3 - 2x^2 + 3x - 6, \text{ divided by } x+1$$

$$\begin{aligned} x+1 &= 0 \\ \underline{\underline{x = -1}} \quad f(-1) &= (-1)^5 - (-1)^4 + (-1)^3 - 2(-1)^2 + 3(-1) - 6 \\ &= -1 - 1 - 1 - 2 - 3 - 6 \\ &= \boxed{-14} \end{aligned}$$

### ② Rational Zero Theorem

$$f(x) = 5x^4 - 3x^3 + 2x^2 - x - 4$$

$$\frac{4}{5} = \frac{\pm 1, \pm 2, \pm 4}{\pm 1, \pm 5}$$

$$= \boxed{\pm 1, \pm \frac{1}{5}, \pm 2, \pm \frac{2}{5}, \pm 4, \pm \frac{4}{5}}$$

4.2 min. Lecture

$$\textcircled{3} \quad 6x^3 - 11x^2 - x + 6$$

$$\frac{p}{q} = \frac{\pm 1, \pm 6, \pm 2, \pm 3}{\pm 1, \pm 6, \pm 2, \pm 3}$$

Possible zeros:  $\pm 1, \pm \frac{1}{6}, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm 6, \pm 3, \pm 2, \pm \frac{2}{3}, \pm \frac{3}{2}$

$$\begin{array}{r} -1 \overline{) 6 \ -11 \ -1 \ 6} \\ \underline{-6 \ 17 \ -16} \\ 6 \ -17 \ 16 \ -10 \end{array}$$

$$\begin{array}{r} 1 \overline{) 6 \ -11 \ -1 \ 6} \\ \underline{\phantom{1} 6 \ -5 \ -6} \\ 6 \ -5 \ -6 \ \boxed{0} \checkmark \end{array}$$

$$\begin{array}{r} 6x^2 - 5x - 6 \\ x-1 \overline{) 6x^3 - 11x^2 - x + 6} \\ \underline{-6x^3 + 6x^2} \\ \phantom{6x^3 -} -5x^2 - x \\ \phantom{6x^3 -} \underline{+5x^2 - 5x} \\ \phantom{6x^3 -} \phantom{5x^2 -} -6x + 6 \\ \phantom{6x^3 -} \phantom{5x^2 -} \underline{-6x + 6} \\ \phantom{6x^3 -} \phantom{5x^2 -} \phantom{-6x + 6} 0 \end{array}$$

$$(x-1)(6x^2 - 5x - 6)$$

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

$$\text{Zeros: } \left\{ 1, -\frac{2}{3}, \frac{3}{2} \right\}$$

## 4.2 mini: Lecture

$$\textcircled{4} \quad 12x^3 + x^2 - \frac{9}{2}x + 1 = 0$$

Show  $[-1, 0]$  contains a zero

$$\begin{array}{l} x = -1 \longrightarrow y = -5.5 \\ x = 0 \longrightarrow y = 1 \end{array} \quad \left. \vphantom{\begin{array}{l} x = -1 \\ x = 0 \end{array}} \right\} \begin{array}{l} \text{change of} \\ \text{signs so there} \\ \text{is a zero} \end{array}$$

Zero is at  $(-.74, 0)$