

*From the homework:*

- p.176 5. Determine whether  $2x - 5$  is a factor of each polynomial.

a)  $2x^3 - 5x^2 - 2x + 5$       c)  $2x^4 - 7x^3 - 13x^2 + 63x - 45$

$$2x - 5 = 0$$

$$x = \frac{5}{2}$$

$$\begin{aligned} P\left(\frac{5}{2}\right) &= 2\left(\frac{5}{2}\right)^3 - 5\left(\frac{5}{2}\right)^2 - 2\left(\frac{5}{2}\right) + 5 \\ &= 2\left(\frac{125}{8}\right) - 5\left(\frac{25}{4}\right) - 5 + 5 \\ &= \frac{125}{4} - \frac{125}{4} + 0 \\ &= 0 \end{aligned}$$

$\therefore P\left(\frac{5}{2}\right) = 0$ ,  $\therefore (2x - 5)$  is a factor of  $2x^3 - 5x^2 - 2x + 5$

## 3.6 Factoring Polynomials: Part 2



### Math Learning Target:

"I can always apply the Remainder Theorem and the Factor Theorem, when it is applicable."

Ex. 1 Factor completely:  $x^4 - 2x^3 - 7x^2 + 8x + 12$

$$f(x) = x^4 - 2x^3 - 7x^2 + 8x + 12$$

$$f(1) = 12$$

$$\begin{aligned} f(2) &= (2)^4 - 2(2)^3 - 7(2)^2 + 8(2) + 12 \\ &= 16 - 16 - 28 + 16 + 12 \\ &= 0 \end{aligned}$$

$\therefore x-2$  is a factor of  $f(x)$

$$f(x) = (x-2)g(x)$$

$$= (x-2)(x^3 + 2x^2 - 7x - 6)$$

$$= (x-2)(x+2)h(x)$$

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

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

$$x-2 \therefore k=2$$

$$\begin{array}{r} 2 | 1 \ -2 \ -7 \ 8 \ 12 \\ \downarrow \quad 2 \ 0 \ -14 \ -12 \\ 1 \ 0 \ -7 \ -6 \ \underline{0R} \end{array}$$

$$\begin{aligned} g(x) &= x^3 + 2x^2 - 7x - 6 \\ &= x^3 - 7x - 6 \end{aligned}$$

$$\begin{aligned} g(-2) &= (-2)^3 - 7(-2) - 6 \\ &= -8 + 14 - 6 \\ &= 0 \end{aligned}$$

$\therefore (x+2)$  is a factor of  $g(x)$

$$\therefore k = 2 [x-k]$$

$$\begin{array}{r} -2 | 1 \ 0 \ -7 \ -6 \\ \downarrow \ -2 \ 4 \ 6 \\ 1 \ -2 \ -3 \ \underline{0R} \end{array}$$

$$\therefore h(x) = x^2 - 2x - 3$$

Ex. 2 Sketch

$$y = -2x^4 + 6x^2 + 4x$$

$$\begin{aligned} f(x) &= -2x^4 + 6x^2 + 4x \\ &= -2x(x^3 - 3x - 2) \\ &= -2x(x+1)(x^2-x-2) \\ &= -2x(x+1)(x-2)(x+1) \end{aligned}$$

$$\begin{array}{l} 0 = -2x(x+1)^2(x-2) \\ \text{if } f(x) = 0 \end{array}$$

$$\begin{array}{l} \therefore \text{zeros: } 0 \quad -1 \quad 2 \\ \text{order: } 1 \quad 2 \quad 1 \end{array}$$

y-int

$$f(0) = 0$$

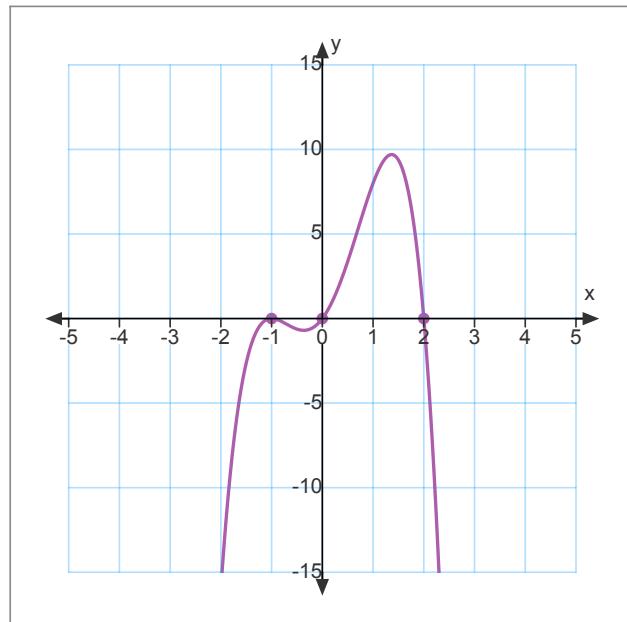
$$y = -2x^4 + 6x^2 + 4x$$

Complete p.177 #6de, 7e, 8e, 9, 10, 14, 16  
Challenge Yourself! #17

$$\begin{aligned} g(x) &= x^3 - 3x - 2 \\ g(1) &= 1^3 - 3(1) - 2 \\ &= 1 - 3 - 2 \\ &= -4 \\ g(-1) &= (-1)^3 - 3(-1) - 2 \\ &= -1 + 3 - 2 \\ &= 0 \\ \therefore (x+1) &\text{ is a factor of } g(x) \\ \text{or } x-k &\therefore k = -1 \end{aligned}$$

$$\begin{array}{r} 10 - 3 - 2 \\ \downarrow -1 \quad 1 \quad 2 \\ 1 \quad -1 \quad -2 \quad OR \end{array}$$

$$\therefore h(x) = x^2 - x - 2$$



Once the core work for today is done,  
for those of you who would like to be challenged...

<http://courseware.cemc.uwaterloo.ca/8/assignments/279/0>