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: $x^4 - 2x^3 - 7x^2 + 8x + 12$

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

$$f(2) = (2)^4 - 2(2)^3 - 7(2)^2 + 8(2) + 12$$
$$= 16 - 16 - 28 + 16 + 12$$
$$= 0$$

$\because f(2) = 0 \quad \therefore x-2$ is a factor

$$\begin{array}{r|l} & x^3 - 7x - 6 \\ x-2 & x^4 - 2x^3 - 7x^2 + 8x + 12 \\ & x^4 - 2x^3 \\ \hline & 0 - 7x^2 + 8x \\ & -7x^2 + 14x \\ \hline & -6x + 12 \\ & -6x + 12 \\ \hline & 0R \end{array}$$

Now
$$f(x) = (x-2)(x^3 - 7x - 6)$$
$$= (x-2)\, g(x)$$

$$g(-2) = (-2)^3 - 7(-2) - 6$$
$$= -8 + 14 - 6$$
$$= 0$$

$\because g(-2) = 0$
$\therefore x+2$ is a factor

$$\begin{array}{r|rrrr} -2 & 1 & 0 & -7 & -6 \\ & \downarrow & -2 & 4 & 6 \\ \hline & 1 & -2 & -3 & 0 \end{array}$$

0 Remainder.

Now, $f(x) = (x-2)(x+2)(x^2 - 2x - 3)$

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

Ex. 2 Sketch

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

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

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

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

$= 0$

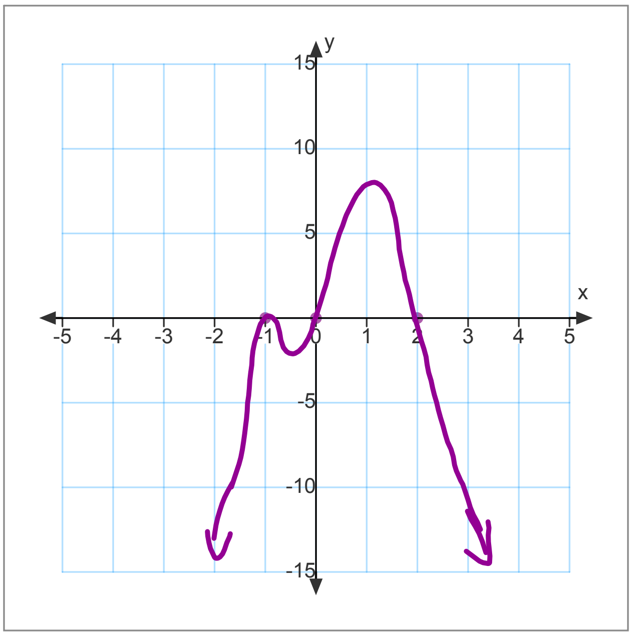
$\therefore x+1$ is a factor

-1	1	0	-3	-2
	↓	-1	1	2
	1	-1	-2	0R

$f(x) = -2x(x+1)(x^2 - x - 2)$

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

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



if $f(x) = 0$

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

zeros	0	-1	2
order	1	2	1

y-int, let $x=0$

$f(0) = -2(0)(1)^2(-2)$

$= 0$

quartic; lead coef. −ve

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

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

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