3.3 Zeros of Polynomial Functions

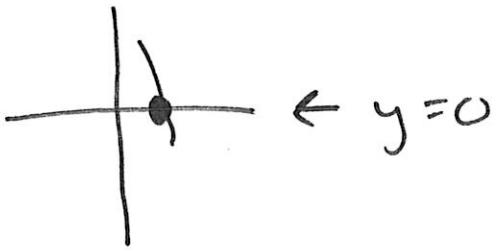
$f(x) = x^2 + x - 2$

factored form $f(x) = (x-1)(x+2)$

Zeros (x-intercepts) at $x = 1$ and $x = -2$

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

↑ when $x = 1$, $y = 0$



Factor Theorem for any polynomial function $f(x)$, $x-k$ is a factor of the polynomial if and only if $f(k) = 0$.

Ex 1 Deciding whether $x-k$ is a factor.

(a) $x-1$ is $x-k$

$f(x) = 2x^4 + 3x^2 - 5x + 7$

1	2	0	3	−5	7
		2	2	5	0
	2	2	5	0	(7)

← remainder

$f(1) = 7$

∴ $x-1$ is not a factor

(Therefore)

3.3 cont

Ex 1 (b) is $x-1$ a factor?

$f(x) = 3x^5 - 2x^4 + x^3 - 8x^2 + 5x + 1$

1	3	-2	1	-8	5	1
		3	1	2	-6	-1
	3	1	2	-6	-1	0 ← Remainder

$\therefore$ $x-1$ IS a factor of $f(x)$ #9, 11

Ex 2 Factoring a polynomial given a zero

Factor $f(x) = 6x^3 + 19x^2 + 2x - 3$ into linear factors (exponents on x equal 1) given that -3 is a zero.

-3	6	19	2	-3
		-18	-3	3
	6	1	-1	0

$f(x) = (x+3)(6x^2 + 1x - 1)$

$\boxed{f(x) = (x+3)(2x+1)(3x-1)}$

$6x^2 + 1x - 1$

$6x^2 + 3x - 2x - 1$

$3x \quad 3x \quad -1 \quad -1$

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

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

-6	1
3(-2)	3-2=1

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