2.2: Synthetic Division

Long division → Always works!!!

synthetic division → division of polynomial using only the coefficients.

→ only works if divisor is in the form $(x \pm \#)$ (# = whole #)

Can I use synthetic?

a) $x-2$ ✓

b) $2x+1$ X

c) x^2+1 X

d) $x-\frac{1}{2}$ X

Ex 1) divide $(x^3-4x^2+6x-4) \div (x-2)$ ← factor!

Step 1: set divisor = 0 & solve

$x-2=0$

$+2 \quad +2$

$x=2$

Step 2: Put that # in a box & list coefficients of our dividend

2	1	-4	6	-4
		+2	-4	4
x	1	-2	2	0 ← remainder

Step 3: Add columns

Step 4: multiply # below line by # in box. Place answer in the next column

Step 5: repeat

Step 6: write coefficients w/ variable 1 degree lower

x^2-2x+2

Scanned with CamScanner

Ex 2) $(x^3 - 7x - 6) \div (x+2)$

$+0x^2$

$x+2=0$

$-2 \quad -2$

$x=-2$

-2	1	0	-7	-6
	↓	-2	4	6
	1	-2	-3	0

x^2-2x-3

you try: $(2x^3 - 7x^2 - 8x + 16) \div (x-4)$

$x-4=0$

$+4 \quad +4$

$x=4$

4	2	-7	-8	16
	↓	8	4	-16
	2	1	-4	0

$2x^2+x-4$

Remainder Theorem: If a polynomial $P(x)$ is divided by $(x-a)$, then the remainder is $P(a)$

Factor Theorem: $(x-a)$ is a factor of the polynomial $P(x)$ if $P(a)=0$

Ex 3) Find remainder for $(x^4 - 5x^2 + 4x + 12) \div (x+4)$

$x+4=0$

$-4 \quad -4$

$x=-4$

$(-4)^4 - 5(-4)^2 + 4(-4) + 12$

$= 172$

Scanned with CamScanner