5.3. Advanced Algebra

DATE: 2/24

Long Division and Synthetic Division

Compare and Contrast

Long Division

Find $(z^2 - 12z - 45) \div (z + 3)$.

Dividend: $z^2 - 12z - 45$ Divisor: $z + 3$

Quotient → $z - 15$

$$z+3 \;\overline{)\; z^2 - 12z - 45}$$

$$-(z^2 + 3z)$$

$$-15z - 45$$

$$-(-15z - 45)$$

$$0$$

↓ Remainder

Ans: $z - 15$

? · z = z^2

z · z = z^2 ✓

? · z = $-15z$

$-15 \cdot z = -15z$ ✓

Synthetic Division

Find $(z^2 - 12z - 45) \div (z + 3)$.

-3 | 1 | -12 | -45

$-3 \cdot 1 = -3$

$-3 \cdot -15 = 45$

	1	-15	0
-3		-3	45

Always one deg. less

$z - 15$

Find $(5x^3 - 13x^2 + 10x - 8) \div (x - 2)$.

Find $(5x^3 - 13x^2 + 10x - 8) \div (x - 2)$.

than original

Find $(5x^3 - 13x^2 + 10x - 8) \div (x - 2)$.

$$x-2 \;\overline{)\; 5x^3 - 13x^2 + 10x - 8}$$

$5x^2 - 3x + 4$

$-(5x^3 - 10x^2)$

$-3x^2 + 10x$

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

$4x - 8$

$-(4x - 8)$

0

Ans: $5x^2 - 3x + 4$

? · $x = 5x^3$

$5x^2 \cdot x = 5x^3$ ✓

? · $x = -3x^2$

$-3x \cdot x = -3x^2$ ✓

? · $x = 4x$

$4 \cdot x = 4x$ ✓

Find $(5x^3 - 13x^2 + 10x - 8) \div (x - 2)$. +2

2	5	−13	+10	−8
		10	−6	8
	5	−3	4	0

$2 \cdot 5 = 10$

$2 \cdot -3 = -6$

$2 \cdot 4 = 8$

$5x^2 - 3x + 4$

one deg. less than original.

Reflect: Which method do you prefer and why? I prefer synthetic substitution...

Do you?

3. $\frac{x^3-6}{x-1}$ $=(x^3-6)\div(x-1)$

x^3+0x^2+0x-1

$1\cdot 1=1$
$1\cdot 1=1$
$1\cdot 1=1$

1	1	0	0	−1
	↓	1	1	1
	1	1	1	0 → No remainder

x^2+x+1

4. $(x^3-6x^2+1)\div(x+2)$

x^3-6x^2+0x+1

−2	1	−6	0	1
		−2	16	−32
	1	−8	16	−31 → Remainder

$x^2-8x+16+\frac{-31}{x+2}$

5. $\frac{x^5-1}{x-1}$

6. $(2x^3-5x^2+4x-4)\div(x-2)$