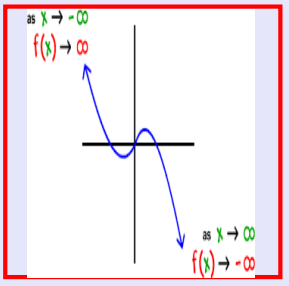
Math 245

Spring 2022

Lecture 29



Dividing $\frac{\text{Polynomial}}{x-c}$ using synthetic division

$\frac{x^2-5x+6}{x-2}$

$x-2$

$c=2$

$2 \mid 1 \quad -5 \quad 6$

$\quad\quad\;\; 2 \quad -6$

$1 \quad -3 \quad 0$ ← Remainder

Final Ans → $x-3$

If we cross-multiply

$\frac{x^2-5x+6}{x-2} = x-3$

$(x-2)(x-3) = x^2-5x+6$

Divide $(2x^3+5x^2-4x-3)$ by $(x-1)$

using Synthetic Division.

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

$x-1$ $\quad c=1$

$x-c$

1	2	5	-4	-3
	↓	2	7	3
	2	7	3	0
	$2x^2$	$+7x$	$+3$	↑ Remainder

Final Ans: $2x^2+7x+3$

$$\frac{2x^3+5x^2-4x-3}{x-1} = 2x^2+7x+3$$

$$(x-1)(2x^2+7x+3) = 2x^3+5x^2-4x-3$$

Divide using Synthetic Division:

$4x^3-7x+8$ (x^2 missing)

$x-3$ $\quad c=3$

$x-c$

3	4	0	-7	8
	↓	12	36	87
	4	12	29	95 ↑ Remainder

$$\frac{4x^3-7x+8}{x-3} = 4x^2+12x+29+\frac{95}{x-3}$$

$$4x^3-7x+8 = (x-3)(4x^2+12x+29)+(x-3)\cdot\frac{95}{x-3}$$

$$= (x-3)(4x^2+12x+29)+95$$

Divide using synthetic division:

$\frac{2x^2 - 8x + 3}{x+2}$

$x+2$

$x-(-2)$ $\quad c=-2$

$x-c$

$-2 \mid 2 \quad -8 \quad 3$

$\quad\quad\downarrow \quad -4 \quad 24$

$\quad 2 \quad -12 \quad 27$

$\frac{2x^2 - 8x + 3}{x+2} = 2x - 12 + \frac{27}{x+2}$ — Remainder

$2x^2 - 8x + 3 = (x+2)(2x-12) + 27$

Divide $\frac{4x^3 - 7x^2 + 10}{x+1}$

$4x^3 - 7x^2 + 0x + 10$ Missing

$x-c \Rightarrow c=-1$

$-1 \mid 4 \quad -7 \quad 0 \quad 10$

$\quad\quad\downarrow \quad -4 \quad 11 \quad -11$

$\quad 4 \quad -11 \quad 11 \quad -1$ — Remainder

$\frac{4x^3 - 7x^2 + 10}{x+1} = 4x^2 - 11x + 11 + \frac{-1}{x+1}$

$4x^3 - 7x^2 + 10 = (x+1)(4x^2 - 11x + 11) - 1$

Use Synthetic division to divide:

$$\frac{x^4 - 13x^2 + 36}{x+3}$$

x^3 Missing

x Missing

$x - c \Rightarrow c = -3$

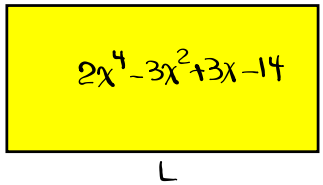
	x^3		x	
-3 |	1	0	-13	0	36
		-3	9	12	-36
	1	-3	-4	12	0

Remainder

$$\frac{x^4 - 13x^2 + 36}{x+3} = x^3 - 3x^2 - 4x + 12$$

$x+3$ is a factor of $x^4 - 13x^2 + 36$.

A rectangular shape has the area $2x^4 - 3x^2 + 3x - 14$ with the width $x+2$. Find its length.



$A = LW$

$(x+2)L = 2x^4 - 3x^2 + 3x - 14$

x^3 missing

$$L = \frac{2x^4 - 3x^2 + 3x - 14}{x+2}$$

$c = -2$

-2 |	2	0	-3	3	-14
		-4	8	-10	14
	2	-4	5	-7	0

Remainder

$L = 2x^3 - 4x^2 + 5x - 7$

$x+2$ is a factor of $2x^4 - 3x^2 + 3x - 14$

Use Synthetic division to divide $\frac{x^5+1}{x+1}$.

$c = -1$

$x^5+1 = x^5 + 0x^4 + 0x^3 + 0x^2 + 0x + 1$

Missing Terms

-1	1	0	0	0	0	1
		-1	1	-1	1	-1
	1	-1	1	-1	1	0

Ans

Remainder

$x+1$ is a factor of x^5+1

$$\frac{x^5+1}{x+1} = \boxed{x^4 - x^3 + x^2 - x + 1}$$