

# MAT 1375: Long division of polynomials and synthetic division

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## Long division of polynomials:

$$\begin{array}{r} \frac{8x^3+18x^2+21x+18}{2x+3} \\ 2x+3 \overline{) \begin{array}{r} 4x^2 + 3x + 6 \\ 8x^3 + 18x^2 + 21x + 18 \\ - 8x^3 - 12x^2 \\ \hline 6x^2 + 21x \\ - 6x^2 - 9x \\ \hline 12x + 18 \\ - 12x - 18 \\ \hline 0 \end{array}} \end{array}$$

## Synthetic division:

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

	1	0	-3	-5	2
2					
	_____				



## Synthetic division:

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

1	0	- 3	- 5	2
2	2			
1				

Multiply



# Synthetic division:

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

1	0	-3	-5	2	
2	2	4			
1	2				

↓     ↓     ↘  
      ↓     ↓     ↓  
      .2    .2    .2

Multiply





# Synthetic division:

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

2	1	0	-3	-5	2
	2	2	4	2	
	1	2	1	2	

1    .2    .2    .2

Multiply

# Synthetic division:

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

	1	0	-3	-5	2	
2		2	4	2		
	1	2	1	-3		

Add

# Synthetic division:

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

1	0	-3	-5	2
2	2	4	2	-6
1	2	1	-3	

↓     ↓     ↓     ↓

↘   ↘   ↘   ↘

.2   .2   .2   .2

+   +   +   +

Multiply

# Synthetic division:

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

2	1	0	-3	-5	2
	↓	↓	↓	↓	↓
	2	+	+	+	+
	↓	↓	↓	↓	↓
	1	2	4	2	-6
	↓	↓	↓	↓	↓
	1	2	1	-3	-4
	↓	↓	↓	↓	↓
	1	2	1	-3	-4

Add

## Synthetic division:

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

$$\begin{array}{r|rrrrr} & 1 & 0 & -3 & -5 & 2 \\ 2 & & 2 & 4 & 2 & -6 \\ \hline & 1 & 2 & 1 & -3 & -4 \end{array}$$

The remainder is the number in the box. The remainder here is -4. The coefficients of the quotient are on the bottom line before the box. The quotient has degree one less than the degree of the dividend, so the quotient here has degree 3.

The quotient is  $x^3 + 2x^2 + x - 3$