Polynomials - definition and arithmetic

There are two ways to define a polynomial in MatDeck.
You can choose to define them using symbolic

$$a := x^4 + 2x^2 - 5$$

$$b := -4x^3 + (2+1i)\cdot x^2 + x - 2 + 3i$$

Or define them using pure numeric combining with the function coef2expr to transform the numerical vector to a symbolical polynomial

$$c := \text{coef2expr}\left(\begin{bmatrix}1 & 0 & 2 & 0 & -5\end{bmatrix}, x\right)$$

$$c = x^4 + 2x^2 - 5$$

Polynomial functions expect arguments to be in the symbolic form. Use functions **coef2expr** and **expr2coef** to change the form of polynomials from a numerical form to a symbolical and from a symbolical to a numerical form respectively.

$$\text{coef2expr}\left(\begin{bmatrix}2 & 0 & -4 & 2 & 8\end{bmatrix}, x\right) = 2x^4 - 4x^2 + 2x + 8$$

From numerical to symbolical form

$$\text{expr2coef}\left(2x^4 - 4x^2 + 2x + 8\right) = \begin{bmatrix}2 & 0 & -4 & 2 & 8\end{bmatrix}$$

From symbolical to numerical form

Let's define the two symbolical polynomials and use them for basic algebraic calculations.

$$pol1 := 2x^3 + 2x^2 - 48x + 72 \qquad pol2 := x + 6$$

Addition of two polynomials

$$pol1 + pol2 = 2x^3 + 2x^2 - 47x + 78$$

or

$$\text{poladd}(pol1, pol2) = 2x^3 + 2x^2 - 47x + 78$$

$$pol1 - pol2 = 2x^3 + 2x^2 - 49x + 66$$

or

$$polsub(pol1, pol2) = 2x^3 + 2x^2 - 49x + 66$$

Multiplication of two polynomials

$$pol1 \cdot pol2 = 2x^4 + 14x^3 - 36x^2 - 216x + 432$$

or

$$polmul(pol1, pol2) = 2x^4 + 14x^3 - 36x^2 - 216x + 432$$

Division of two polynomials

$$pol1 / pol2 = \frac{2x^3 + 2x^2 - 48x + 72}{x + 6}$$

or

$$poldiv(pol1, pol2) = \begin{bmatrix} 2x^2 - 10x + 12 & 0 \end{bmatrix}$$

If there is a remainder from a division of polynomials, the symbolic division will return the fraction while the poldiv function will return a vector with the division result and remainder. In the above example, there was no remainder after the division (the second argument of resulting vector was 0).

$$pol3 := x^3 - 3x^2 + 5x - 7 \qquad pol4 := x + 10$$

$$pol3 / pol4 = \frac{x^3 - 3x^2 + 5x - 7}{x + 10}$$

or

$$poldiv(pol3, pol4) = \begin{bmatrix} x^2 - 13x + 135 & -1357 \end{bmatrix}$$