Finding Roots of Polynomials Using MathCad

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Introduction.

There are several applications in chemical engineering processes which result in a polynomial equation of an unknown variable. Some examples include the cubic equations of state such as Van der Waals, Redlich-Kwong and Peng-Robinson. Other situations result from geometrical relationships such as area or volume, or result from physical relationships such as radiation heat transfer.

MathCad Procudure.

1. Write the polynomial as a function.
2. Extract the coefficients of the function into a variable.
3. Using the function **polyroots( )** to obtain all the roots.

Example:

$$f(x) := 0.2 \cdot x^3 - x^2 + 5x - 50 \qquad C := f(x)\ coeffs, x \rightarrow \begin{pmatrix} -50 \\ 5 \\ -1 \\ .2 \end{pmatrix}$$

$$r := polyroots(C) \qquad r = \begin{pmatrix} -0.883 - 6.014i \\ -0.883 + 6.014i \\ 6.766 \end{pmatrix}$$

Remarks:

a) In finding the coefficients, use **[ctrl shift period]** to obtain a placeholder. Then type **coeffs** followed by comma and the unknown variable. A more general alternative, is to use **[view]→[toolbars]→[symbolic]** then select **coeffs**. This will allow for several symbolic manipulation entries, such as **float** (to set the number of significant figures in the result).

b) The **polyroots( )** function will yield all the roots. Thus, the user will need to determine which roots makes physical sense.

c) This method does not allow for units.