Cubic Equation (translated by WKH)

There are two programs available. The first program can only calculate real roots, so if you want to calculate complex roots, please use the second program!

- Program 1 (Real roots) (Recommend)

  Mode Selection: The program needs to be executed in COMP mode (real numbers), so after selecting the new program location, press 1 to choose COMP mode.

  Program Input Method: (130 bytes)

  ?→A: ?→B: ?→C: ?→M: - B⌟ (3A→B: BCM+: C⌟ A→C:
  B^3- M⌟ (2A→M: B^2- C⌟ 3→D: M^2- Ans^3:
  If 0>Ans: Then 2 √(D) cos($3^{-1}\cos^{-1}$(M÷√(D^3: Else √(AnsM+:
  $\sqrt[3]{}$(M)+$\sqrt[3]{}$(M - 2 Ans: IfEnd: Ans + B→A◢ 3B - Ans→M:
  M⌟ 2 + √(AM - C + M^2⌟ 4 M- →B◢ M

- Program 2 (Complex Numbers)

  Mode Selection: The program needs to be executed in CMPLX mode. Therefore, after selecting the new program location, press 2 to choose CMPLX mode.

  Program Input Method: (126 bytes)

  ?→A: ?→B: - B⌟ (3A→B: ?→C: C⌟ A→C: ?→M:
  B^3- BAns⌟ 2 - M⌟ (2A→M: √((C⌟ 3 - B^2)^3+ Ans^2M+:
  If Ans=Conig(Ans: Then $\sqrt[3]{}$(M) +$\sqrt[3]{}$(M - 2Ans:
  Else 2 $\sqrt[3]{}$(Abs(M)) cos (3^{-1}arg(M: IfEnd: Ans + B→A◢
  3B - Ans→M: M⌟ 2 + √(AM - C + M^2⌟ 4M- →B◢ M

Testing Example Equations: $3x^3 – 5x^2 + x - 4 = 0$

Press Prog, then press 3 EXE - 5 EXE 1 EXE - 4 EXE (displaying the first root as 1.86977).

Press EXE **(The second program displays a Math ERROR, while the first program displays R<=>I in the upper right corner, indicating a complex solution)**. (Displaying the real part of the second root as -0.101554)

Press Shift Re<=>Im (Display the second root's imaginary part as 0.838323i)

Press EXE (Display the real part of the third root as -0.101554)

Press Shift Re<=>Im (Display the imaginary part of the third root as -0.838323i)