Graph to find all REAL solutions.

$$x^3 - 4x^2 + x + 26 = 0 \longrightarrow x = -2$$

since -2 is a real solution (x+2) is a factor of the original polynomial.

If x+2 is a factor use polynomial division to find another factor.

$$
\begin{array}{r|l}
 & x^2 - 6x + 13 \\
\hline
x+2 & x^3 - 4x^2 + x + 26 \\
 - & x^3 + 2x^2 \\
\hline
 & -6x^2 + x \\
 - & -6x^2 - 12x \\
\hline
 & 13x + 26 \\
 - & 13x + 26 \\
\hline
 & 0
\end{array}
$$

Find the zeros of this other factor to get the remaining 2 solutions.
(use Quadratic Formula)
or completing the sq.

$$x^2 - 6x + 13$$

$$b^2 - 4ac = -16$$

$$x = \frac{6 \pm \sqrt{-16}}{2} = \frac{6 \pm 4i}{2}$$

$$= \boxed{3 \pm 2i}$$

Therefore, the three solutions to the original cubic are -2(real) and 3±2i (imaginary)

-1 and 2 are solutions of this equation. The other two solutions are imaginary.
Find the other two solutions.

turn these two zeros into the following factors: (x+1) & (x-2). You can now divide the original equation by one of these factors:

$$x^4 - x^3 + 2x^2 - 4x - 8 = 0$$

$$
\begin{array}{r|l}
 & x^3 - 2x^2 + 4x - 8 \\
\hline
x+1 & x^4 - x^3 + 2x^2 - 4x - 8 \\
 - & x^4 + x^3 \\
\hline
 & -2x^3 + 2x^2 \\
 - & -2x^3 - 2x^2 \\
\hline
 & 4x^2 - 4x \\
 - & 4x^2 + 4x \\
\hline
 & -8x - 8 \\
 - & -8x - 8 \\
\hline
 & 0
\end{array}
$$

At this point we could take this quotient, $x^3 - 2x^2 + 4x - 8$ and divide by the other factor, x-2, or we could try to factor this cubic:

	x	-2
x^2	x^3	$-2x^2$
$+4$	$+4x$	-8

If we did divide $x^3 - 2x^2 + 4x - 8$ by x-2 we would end up with $x^2 + 4$ as well.

We now have the following factors of the the original problem:
$(x+1)(x-2)(x^2+4)$

These factors lead to the following four solutions: $\boxed{x = -1, 2, \pm 2i}$