

Answer on Question #78502 – Math – Other

Question

Obtain the discriminant of the equation $2x^3 - 23x^2 + 82x - 78 = 0$. Hence provide the nature of its roots.

Solution

The discriminant of a cubic equation $ax^3 + bx^2 + cx + d = 0$ is given by

$$\Delta_3 = b^2c^2 - 4ac^3 - 4b^3d - 27a^2d^2 + 18abcd$$

In our case

$$\begin{aligned}\Delta_3 &= (-23)^2 82^2 - 4 \cdot 2 \cdot 82^3 - 4 \cdot (-23)^3 (-78) - 27(2)^2 (-78)^2 + 18 \cdot 2 \cdot (-23) 82 (-78) \\ &= -11236\end{aligned}$$

Since $\Delta_3 < 0$, the equation has one real root and two complex conjugate roots.

Answer: -11236 , one real root and two complex conjugate roots.