

Answer on Question #69339 – Math – Algebra

Question

Use the Factor Theorem to find the linear factors of $2x^3 - 9x^2 - 2x + 24$

Solution

It is easy to guess that $x = 2$ is a solution of the equation $2x^3 - 9x^2 - 2x + 24 = 0$ (all possible solutions should divide the constant term 24, so we can check all integer divisors of 24).

Dividing the polynomial $2x^3 - 9x^2 - 2x + 24$ by $x - 2$ one obtains the polynomial $2x^2 - 5x - 12$.

By the Factor Theorem we then have that

$$2x^3 - 9x^2 - 2x + 24 = (x - 2)(2x^2 - 5x - 12)$$

The solutions of the quadratic equation $2x^2 - 5x - 12 = 0$ are 4 and -1.5.

Then again by the Factor Theorem we obtain

$$2x^2 - 5x - 12 = 2(x - 4)(x + 1.5).$$

Hence finally we get

$$\begin{aligned} 2x^3 - 9x^2 - 2x + 24 &= (x - 2)(2x^2 - 5x - 12) = (x - 2) \cdot 2(x - 4)(x + 1.5) \\ &= 2(x - 2)(x - 4)(x + 1.5) \end{aligned}$$

Answer: $2x^3 - 9x^2 - 2x + 24 = 2(x - 2)(x - 4)(x + 1.5)$.