

AI1110 Assignment-1

ICSE Class-10 2017

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Q4(a): What must be subtracted from $16x^3 - 8x^2 + 4x + 7$ so that the resulting expression has $2x + 1$ as a factor?

Solution: Let $p(x) = 16x^3 - 8x^2 + 4x + 7$ and $d(x) = 2x + 1$.

Polynomial division of $p(x)$ with $d(x)$:

$$\begin{array}{r}
 8x^2 - 8x + 6 \\
 2x + 1 \overline{) 16x^3 - 8x^2 + 4x + 7} \\
 \underline{- 16x^3 - 8x^2} \\
 - 16x^2 + 4x \\
 \underline{16x^2 + 8x} \\
 12x + 7 \\
 \underline{- 12x - 6} \\
 1
 \end{array}$$

From the above division, it is clear that 1 has to be subtracted from the polynomial $p(x)$, so that $d(x)$ becomes factor of the resulting polynomial after subtraction.

Using remainder theorem:

Remainder theorem states that remainder of division of a polynomial $f(x)$ by a linear polynomial $x - r$ is equal to $f(r)$. So, remainder of $p(x)$ divided by $d(x)$ is $p(\frac{-1}{2})$.

$$p\left(\frac{-1}{2}\right) = 16\left(\frac{-1}{2}\right)^3 - 8\left(\frac{-1}{2}\right)^2 + 4\left(\frac{-1}{2}\right) + 7 \quad (1)$$

$$= 1 \quad (2)$$

So, subtracting 1 from the given polynomial $p(x)$ gives a polynomial which has $d(x)$ as its factor.