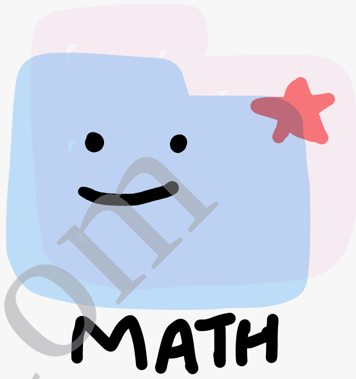
Polynomials
Ex. 2.3



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Ex. 2.3

1. Let $p(x) = x^3 + 3x^2 + 3x + 1$

(i) by remainder theorem

remainder $= p(-1)$

$= (-1)^3 + 3(-1)^2 + 3(-1) + 1$

$= -1 + 3 - 3 + 1$

$= 4 - 4$

$= 0$

(ii) by remainder theorem

remainder $= p\left(\frac{1}{2}\right)$

$= \left(\frac{1}{2}\right)^3 + 3\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{2}\right) + 1$

$= \frac{1}{8} + \frac{3}{4} + \frac{3}{2} + 1$

$= \frac{1 + 6 + 12 + 8}{8}$

$= \frac{27}{8}$

(iii) by remainder theorem

remainder $= p(0)$

$= 0^3 + 3(0)^2 + 3(0) + 1$

$= 1$

(iv) by remainder theorem

remainder $= p(-\pi)$

$= (-\pi)^3 + 3(-\pi)^2 + 3(-\pi) + 1$

$= -\pi^3 + 3\pi^2 - 3\pi + 1$

(v) by remainder theorem

remainder $= p\left(-\frac{5}{2}\right)$

$= \left(-\frac{5}{2}\right)^3 + 3\left(-\frac{5}{2}\right)^2 + 3\left(-\frac{5}{2}\right) + 1$

$= \frac{-125}{8} + 3 \times \frac{25}{4} - \frac{15}{2} + 1$

$= \frac{-125}{8} + \frac{75}{4} - \frac{15}{2} + 1$

$= \frac{-125 + 150 - 60 + 8}{8}$

$= \frac{158 - 185}{8}$

$= -\frac{27}{8}$

2. Let $p(x) = x^3 - ax^2 + 6x - a$

by remainder theorem

remainder $= p(a)$

$= a^3 - a(a)^2 + 6a - a$

$= \cancel{a^3} - \cancel{a^3} + 5a$

$= 5a$

3. Let $p(x) = 3x^3 + 7x$

by remainder theorem

remainder $= p\left(-\frac{7}{3}\right)$

$= 3\left(-\frac{7}{3}\right)^3 + 7\left(-\frac{7}{3}\right)$

or $p\left(-\frac{7}{3}\right) = \frac{1}{3}\left(\frac{-343}{27}\right) - \frac{49}{3}$

$= -\frac{343}{9} - \frac{49}{3}$

$= \frac{-343-147}{9}$

$= -\frac{490}{9} \neq 0$

Since remainder $\neq 0$

$\therefore$ $7+3x$ is not a factor of $p(x)$.