Assignment 19

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***Abstract*—This document explains the g.c.d of polynomial.**

Download all python codes from

https://github.com/satyam463/Assignment−19/blob/main/Assignment%2019%20.py

1 Problem Statement

Find the g.c.d of each of the following pairs of polynomials.

$$2x^5 - x^3 - 3x^2 - 6x + 4, x^4 + x^3 - x^2 - 2x - 2 \tag{1.0.1}$$

2 Solution

Refer Table 0.

Let the field be rational numbers	
Steps	**Explanation**
Say f(x) and g(x)	$$f(x) = 2x^5 - x^3 - 3x^2 - 6x + 4 \quad (2.0.1)$$ $$g(x) = x^4 + x^3 - x^2 - 2x - 2 \quad (2.0.2)$$
Expanding f(x) in term of g(x)	$$2x^5 - x^3 - 3x^2 - 6x + 4 = \left(x^4 + x^3 - x^2 - 2x - 2\right)(2x - 2) + \left(3x^3 - x^2 - 6x\right) \quad (2.0.3)$$
Expanding degree four polynomial	$$x^4 + x^3 - x^2 - 2x - 2 = \left(3x^3 - x^2 - 6x\right)\left(\frac{1}{3}x + \frac{4}{9}\right) + \left(\frac{13}{9}x^2 + \frac{2}{3}x - 2\right) \quad (2.0.4)$$
Expanding degree three polynomial	$$3x^3 - x^2 - 6x = \left(\frac{13}{9}x^2 + \frac{2}{3}x - 2\right)\left(\frac{27}{13}x - \frac{279}{169}\right) + \left(-\frac{126}{169}x - \frac{558}{169}\right) \quad (2.0.5)$$
Expanding degree two polynomial	$$\frac{13}{9}x^2 + \frac{2}{3}x - 2 = \left(-\frac{126}{169}x - \frac{558}{169}\right)\left(-\frac{2197}{1134}x + \frac{61009}{7938}\right) + \left(\frac{10309}{441}\right) \quad (2.0.6)$$ Since it contains scalar polynomial hence the g.c.d of f(x) , g(x) is 1.

TABLE 0: Solution