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1.5 Algebraic Division

$$1) \quad \frac{n^2 - 5n + 7}{n-3} \equiv n - 2 + \frac{1}{n-3}$$

$$\begin{array}{r} n-2 \\ n-3 \overline{) n^2 - 5n + 7} \\ \underline{n^2 - 3n} \\ -2n + 7 \\ \underline{-2n + 6} \\ 1 \end{array}$$

Hence $n - 2 + \frac{1}{n-3}$

2a)

$$\begin{array}{r} n-6 \\ n+1 \overline{) n^2 - 5n + 9} \\ \underline{n^2 + n} \\ -6n + 9 \\ \underline{-6n - 6} \\ 15 \end{array}$$

\therefore The remainder is 15

$$b) \quad f(n) = \frac{n^2 - 5n + 9}{n+1} \equiv n - 6 + \frac{15}{n+1}$$

1.5 Algebraic Division

3]

$$\begin{array}{r} n^2 - 4n + 12 \\ n+3 \overline{) n^3 - n^2 + 0n - 9} \\ \underline{n^3 + 3n^2} \\ -4n^2 + 0n - 9 \\ \underline{-4n^2 - 12n} \\ + \\ 12n - 9 \\ \underline{12n + 36} \\ -45 \end{array}$$

$$\Rightarrow n^2 - 4n + 12 - \frac{45}{n+3}$$

4]

$$\begin{array}{r} n^2 + 2n + 8 \\ n-4 \overline{) n^3 - 2n^2 + 0n + 5} \\ \underline{n^3 - 4n^2} \\ 2n^2 + 0n + 5 \\ \underline{2n^2 - 8n} \\ + \\ 8n + 5 \\ \underline{8n - 32} \\ + \\ 37 \end{array}$$

$$\Rightarrow (n^2 + 2n + 8)(n - 4) + 37$$

1.5 Algebraic Division

$$5) \frac{18n^2 + 22n - 7}{(n+2)(3n-1)} \equiv A + \frac{B}{n+2} + \frac{C}{3n-1}$$

$$\frac{18n^2 + 22n - 7}{3n^2 - n + 6n - 2} \Rightarrow \frac{18n^2 + 22n - 7}{3n^2 + 5n - 2}$$

$$\begin{array}{r} 6 \\ 3n^2 + 5n - 2 \overline{) 18n^2 + 22n - 7} \\ \underline{18n^2 + 30n - 12} \\ -8n + 5 \end{array}$$

$$\equiv 6 + \frac{-8n + 5}{(n+2)(3n-1)}$$

$$\text{let } \frac{-8n + 5}{(n+2)(3n-1)} \equiv \frac{B}{n+2} + \frac{C}{3n-1}$$

$$\Rightarrow B(3n-1) + C(n+2)$$

$$\text{When } n = -2, \quad \text{when } n = \frac{1}{3}$$

$$21 = -7B$$

$$B = -3$$

$$\frac{7}{3} = \frac{7}{3}C$$

$$C = 1$$

$$\text{So } A = 6, \quad B = -3, \quad C = 1$$

$$\Rightarrow 6 - \frac{3}{n+2} + \frac{1}{3n-1}$$

1.5 Algebraic Division

6]

$$\begin{array}{r} 2n^2 + 2n + 11 \\ n-3 \overline{) 2n^3 - 4n^2 + 5n - 1} \\ \underline{2n^3 - 6n^2} \\ 2n^2 + 5n - 1 \\ \underline{2n^2 - 6n} \\ 11n - 1 \\ \underline{11n - 33} \\ 32 \end{array}$$

$$\Rightarrow 2n^2 + 2n + 11 + \frac{32}{n-3}$$

7]

$$\begin{array}{r} n^2 - 5 \\ n^2 + 2 \overline{) n^4 - 0n^3 - 3n^2 + 0n + 5} \\ \underline{n^4} \\ -5n^2 \\ \underline{-5n^2 - 10} \\ 15 \end{array}$$

$$\Rightarrow n^2 - 5 + \frac{15}{n^2 + 2}$$

1.5 Algebraic Division

$$8) \frac{4n^2 - 5n - 3}{(n+1)(2n-1)} = \frac{4n^2 - 5n - 3}{2n^2 + n - 1}$$

$$\begin{array}{r} 2 \\ \hline 2n^2 + n - 1 \overline{) 4n^2 - 5n - 3} \\ \underline{4n^2 + 2n - 2} \\ -7n + 1 \end{array}$$

$$= 2 + \frac{(-7n+1)}{(n+1)(2n-1)}$$

$$\text{let } \frac{-7n+1}{(n+1)(2n-1)} = \frac{B}{n+1} + \frac{C}{2n-1}$$

$$\Rightarrow B(2n-1) + C(n+1)$$

$$\text{When } n = -1$$

$$6 = -3B$$

$$B = -2$$

$$\text{when } n = \frac{1}{2}$$

$$-\frac{9}{2} = \frac{3}{2}C$$

$$C = -3$$

$$\therefore A = 2, B = -2, C = -3$$

$$\Rightarrow 2 - \frac{2}{n+1} - \frac{3}{2n-1}$$

1.5 Algebraic Division

9)

$$\begin{array}{r} 3n^2 - 5n \\ \hline n^2 + 2 \overline{) 3n^4 - 5n^3 + 6n^2 - 12n + 5} \\ \underline{3n^4} \\ -5n^3 \\ \underline{-5n^3} \\ 6n^2 - 12n + 5 \\ \underline{6n^2} \\ -12n + 5 \\ \underline{-12n} \\ + 5 \\ \underline{+} \\ -2n + 5 \end{array}$$

$$\therefore A = 3, B = -5, C = 0, \\ D = -2, E = 5$$

$$\Rightarrow (3n^2 - 5n)(n^2 + 2) - 2n + 5$$

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