

1 Express $\frac{6}{x^2-9} - \frac{7}{2x^2-5x-3}$ as a single fraction in its simplest form. (6)

2 $f(x) \equiv \frac{3}{2x+3} - \frac{x+9}{2x^2+11x+12}, \quad x > 0.$

Show that $f(x) = \frac{1}{x+4}$. (5)

3 a Express $\frac{1}{x-6} - \frac{2}{x^2-36}$ as a single fraction in its simplest form. (3)

b Hence solve the equation

$$\frac{1}{x-6} - \frac{2}{x^2-36} = \frac{1}{2},$$

giving your answers in the form $a + b\sqrt{5}$, where $a, b \in \mathbb{Z}$. (4)

4 $f(x) \equiv 2x^3 - 5x^2 - 23x - 10.$

a Show that $(x-5)$ is a factor of $f(x)$. (2)

b Express $\frac{f(x)}{2x^2-9x-5}$ in its simplest form. (5)

5 Given that the equation

$$\frac{x+6}{x^2+9x+18} + \frac{x-p}{x+7} = 0$$

has real, equal roots, find the possible values of the constant p . (7)

6 Express $\frac{1}{3x-1} - \frac{3x}{9x^2-6x+1} - \frac{1}{3x^2-x}$ as a single fraction in its simplest form. (5)

7 a Simplify

i $\frac{7x+14}{4-x^2},$

ii $\frac{2x^2+x-28}{3x^2+12x}.$ (4)

b Hence show that the equation $\frac{7x+14}{4-x^2} = \frac{2x^2+x-28}{3x^2+12x}$ has no real roots. (4)

8 The first three terms of an arithmetic series are $\frac{1}{t-2}$, $\frac{1}{2}$ and $\frac{4}{t^2-2t}$ respectively.

a Show that $\frac{4}{t^2-2t} + \frac{1}{t-2} = 1.$ (2)

b Given that the common difference of the series is not zero, find the value of t and the first term of the series. (5)