18 Solve the equation

$$\frac{5}{x+2} + \frac{3}{x^2+2x} = 2$$

Show clear algebraic working.

$\frac{5}{x+2} + \frac{3}{x(x+2)} = 2$

$\frac{5x}{x(x+2)} + \frac{3}{x(x+2)} = 2$

$\frac{5x+3}{x(x+2)} = 2$

$\frac{5x+3}{x^2+2x} = 2$

$5x+3 = 2(x^2+2x)$

$5x+3 = 2x^2+4x$

$0 = 2x^2 - 1x - 3$

$0 = (2x+1)(x-3)$

$2x+1=0$ $\quad$ $x-3=0$

$2x = -1$ $\quad$ $x = 3$

$x = \frac{-1}{2}$

(Total for Question 18 is 5 marks)

20 Given that $k = x - y$ and $x = \frac{1}{4y}$

express $\frac{5k}{x+2}$ in the form $\frac{a - by^2}{c + dy}$ where a, b, c and d are integers.

$k = x - y$

$k = \frac{1}{4y} - y$

$k = \frac{1}{4y} - \frac{y(4y)}{4y}$

$k = \frac{1 - 4y^2}{4y}$

$x + 2$

$\frac{1}{4y} + 2$

$\frac{1}{4y} + \frac{2(4y)}{4y}$

$\frac{1 + 8y}{4y}$

$\frac{5k}{x+2} = \frac{5\left(\frac{1-4y^2}{4y}\right)}{\frac{1+8y}{4y}}$

$= \frac{5-20y^2}{4y} \div \frac{1+8y}{4y}$

$= \frac{5-20y^2}{4y} \times \frac{4y}{1+8y}$

$= \frac{5-20y^2}{1+8y}$

(Total for Question 20 is 3 marks)

21 Write $\dfrac{25x^2 - 64}{5x^2 - 13x - 6} \times \dfrac{x^2 - 8x + 15}{5x + 8} - (x - 7)$

as a single fraction in its simplest form.
Show clear algebraic working.

$\dfrac{(5x-8)(5x+8)}{(5x+2)(x-3)} \times \dfrac{(x-3)(x-5)}{5x+8} - (x-7)$

$\dfrac{(5x-8)(5x+8)}{(5x+2)(x-3)} \times \dfrac{(x-3)(x-5)}{5x+8} - (x-7)$

$\dfrac{5x-8}{5x+2} \times (x-5) - (x-7)$

$\dfrac{(5x-8)(x-5)}{5x+2} - (x-7)$

$\dfrac{(5x-8)(x-5)}{5x+2} - \dfrac{(x-7)(5x+2)}{5x+2}$

$\dfrac{5x^2 - 25x - 8x + 40 - (5x^2 - 35x + 2x - 14)}{5x+2}$

$\dfrac{5x^2 - 33x + 40 - 5x^2 + 33x + 14}{5x+2}$

$= \dfrac{54}{5x+2}$

(Total for Question 21 is 4 marks)

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21 Express

$$\frac{1}{3x-2} \times \frac{9x^2-4}{3x^2-13x-10} - \frac{7}{x-1}$$

as a single fraction in its simplest form.

$\frac{1}{3x-2} \times \frac{(3x+2)(3x-2)}{(3x+2)(x-5)} - \frac{7}{x-1}$

$\frac{1}{3x-2} \times \frac{(3x+2)(3x-2)}{(3x+2)(x-5)} - \frac{7}{x-1}$

$\frac{1}{x-5} - \frac{7}{x-1}$

$\frac{1(x-1) - 7(x-5)}{(x-5)(x-1)}$

$\frac{x-1-(7x-35)}{(x-5)(x-1)}$

$\frac{x-1-7x+35}{(x-5)(x-1)}$

$\frac{-6x+34}{(x-5)(x-1)}$

.....

(Total for Question 21 is 5 marks)

21 (a) Simplify fully $\dfrac{10x^2 + 23x + 12}{4x^2 - 9}$

$$\frac{(2x+3)(5x+4)}{(2x+3)(2x-3)}$$

$$= \frac{5x+4}{2x-3}$$

(3)

(4)

(Total for Question 21 is 7 marks)

22 Express $\dfrac{4x^2 - 25}{5x^2 + 2x - 7} \times \left(\dfrac{2}{x - 3} - \dfrac{3}{2x - 5} \right)$ as a single fraction in its simplest form.

$$\frac{(2x-5)(2x+5)}{(5x+7)(x-1)} \times \left(\frac{2(2x-5) - 3(x-3)}{(x-3)(2x-5)} \right)$$

$$\frac{(2x-5)(2x+5)}{(5x+7)(x-1)} \times \left(\frac{4x-10-3x+9}{(x-3)(2x-5)} \right)$$

$$\frac{(2x-5)(2x+5)}{(5x+7)(x-1)} \times \left(\frac{x-1}{(x-3)(2x-5)} \right)$$

$$\frac{\cancel{(2x-5)}(2x+5)}{(5x+7)\cancel{(x-1)}} \times \left(\frac{\cancel{x-1}}{(x-3)\cancel{(2x-5)}} \right)$$

$$\frac{2x+5}{(5x+7)(x-3)}$$

(Total for Question 22 is 4 marks)

22 Simplify fully $\dfrac{6x^3 + 13x^2 - 5x}{4x^2 - 25}$

$\dfrac{x(6x^2+13x-5)}{(2x+5)(2x-5)}$

$\dfrac{x(3x-1)(2x+5)}{(2x+5)(2x-5)}$

$\dfrac{x(3x-1)}{2x-5}$

(Total for Question 22 is 3 marks)

23 Show that $\dfrac{16x^2 - 36}{x - 7} \div \dfrac{2x^2 + 7x + 6}{x^2 - 5x - 14} - (7 + 8x) = n$

where n is an integer to be found.
Show clear algebraic working.

$\dfrac{(4x+6)(4x-6)}{x-7} \div \dfrac{(2x+3)(x+2)}{(x-7)(x+2)} - (7+8x)$

$\dfrac{2(2x+3)(4x-6)}{x-7} \times \dfrac{(x-7)(x+2)}{(2x+3)(x+2)} - (7+8x)$

$2(4x-6) \qquad -(7+8x)$

$8x - 12 - 7 - 8x$

$= -19$

$n = -19$

(Total for Question 23 is 4 marks)

23 Express $\left(\frac{20}{x^2-36}-\frac{2}{x-6}\right)\times\frac{1}{4-x}$ as a single fraction in its simplest form.

$$\left(\frac{20}{(x-6)(x+6)}-\frac{2}{(x-6)}\right)\times\frac{1}{4-x}$$

$$\left(\frac{20}{(x-6)(x+6)}-\frac{2(x+6)}{(x-6)(x+6)}\right)\times\frac{1}{4-x}$$

$$\left(\frac{20-2x-12}{(x-6)(x+6)}\right)\times\frac{1}{4-x}$$

$$\frac{8-2x}{(x-6)(x+6)}\times\frac{1}{4-x}$$

$$\frac{2(4-x)}{(x-6)(x+6)}\times\frac{1}{4-x}$$

(Total for Question 23 is 3 marks)

$$\frac{2}{(x-6)(x+6)}$$

24 Solve $\dfrac{45x^3-80x}{3x^2+x-4}\times\left(\dfrac{1}{3x-4}+\dfrac{1}{x}\right)=\dfrac{4(x+2)}{5x-8}$

Show clear algebraic working.

$\dfrac{5x(9x^2-16)}{(3x+4)(x-1)} \times \left(\dfrac{1(x)+1(3x-4)}{(3x-4)\,x}\right) = \dfrac{4(x+2)}{5x-8}$

$\left(\dfrac{5x\,(3x+4)(3x-4)}{(3x+4)(x-1)}\right) \times \left(\dfrac{x+3x-4}{(3x-4)\,x}\right) = \dfrac{4(x+2)}{5x-8}$

$\left(\dfrac{5x\,(3x+4)(3x-4}{(3x+4)(x-1)}\right) \times \left(\dfrac{4x-4}{(3x-4)\,x}\right) = \dfrac{4(x+2)}{5x-8}$

$\dfrac{5x\,(3x+4)(3x-4)}{(3x+4)(x-1)} \times \dfrac{4(x-1)}{(3x-4)\,x} = \dfrac{4(x+2)}{5x-8}$

5×4

$= \dfrac{4x+8}{5x-8}$

$20 = \dfrac{4x+8}{5x-8}$

$20(5x-8) = 4x+8$

$100x - 160 = 4x + 8$

$96x = 168$

$x = \dfrac{168}{90} = 1.75$ = ...

(Total for Question 24 is 5 marks)

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24 Express

$$\left(\frac{4}{2x-5}-\frac{3}{2x-3}\right)\div\frac{9x-4x^3}{6x^2-17x+5}$$

as a single fraction in its simplest form.

$$\frac{4(2x-3)-3(2x-5)}{(2x-5)(2x-3)} \div \frac{x(9-4x^2)}{(3x-1)(2x-5)}$$

$$\frac{8x-12-6x+15}{(2x-5)(2x-3)} \div \frac{x(3-2x)(3+2x)}{(3x-1)(2x-5)}$$

$$\frac{2x+3}{(2x-5)(2x-3)} \times \frac{(3x-1)(2x-5)}{x(3-2x)(3+2x)}$$

$$\frac{3x-1}{x(2x-3)(3-2x)}$$

(Total for Question 24 is 4 marks)

26 Write

$$\frac{4x^2 - 17x - 15}{2x - 1} \times \frac{2x^2 - 7x + 3}{x^2 - 25} + (29 - 4x)$$

as a single fraction in its simplest form.

$$\frac{(4x+3)(x-5)}{2x-1} \times \frac{(2x-1)(x-3)}{(x-5)(x+5)} + (29-4x)$$

$$\frac{(4x+3)(x-3)}{x+5} + \frac{29-4x(x+5)}{x+5}$$

$$\frac{4x^2 - 12x + 3x - 9 + 29x + 145 - 4x^2 - 20x}{x+5}$$

$$\frac{4x^2 - 9x - 9 + 9x + 145 - 4x^2}{x+5}$$

$$\frac{136}{x+5}$$

(Total for Question 26 is 4 marks)

26 Write $4 - \left[(3x - 5) \div \frac{3x^2 + x - 10}{4x - 1} \right]$ as a single fraction in its simplest form.

$4 - \left[(3x-5) \div \frac{(3x-5)(x+2)}{4x-1} \right]$

$4 - \left[\frac{(3x-5)}{1} \times \frac{(4x-1)}{(3x-5)(x+2)} \right]$

$4 - \left[\frac{4x-1}{x+2} \right]$

$\frac{4(x+2)}{(x+2)} - \left[\frac{4x-1}{x+2} \right]$

$\frac{4x+8 \quad -4x+1}{x+2}$

$\frac{9}{x+2}$

.....

(Total for Question 26 is 4 marks)

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