A*

8 Solve the following equations.

a $\frac{4}{x+1} + \frac{5}{x+2} = 2$

b $\frac{18}{4x-1} - \frac{1}{x+1} = 1$

c $\frac{2x-1}{2} - \frac{6}{x+1} = 1$

d $\frac{3}{2x-1} - \frac{4}{3x-1} = 1$

9 Simplify the following expressions.

a $\frac{x^2+2x-3}{2x^2+7x+3}$

b $\frac{4x^2-1}{2x^2+5x-3}$

c $\frac{6x^2+x-2}{9x^2-4}$

d $\frac{4x^2+x-3}{4x^2-7x+3}$

e $\frac{4x^2-25}{8x^2-22x+5}$

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e $\dfrac{4x^2 - 25}{8x^2 - 22x + 5}$

$4x^2 - 25 = (2x)^2 - 5^2$

$= (2x+5)(2x-5)$

$8x^2 - 22x + 5$

$8 \times 5 = 40$

$-2 - 20$

$= 8x^2 - 2x - 20x + 5$

$= 2x(4x-1) - 5(4x-1)$

$= (2x-5)(4x-1)$

e $\dfrac{4x^2 - 25}{8x^2 - 22x + 5} = \dfrac{(2x+5)\cancel{(2x-5)}}{\cancel{(2x-5)}(4x-1)} = \dfrac{2x+5}{4x-1}$

Classwork

8 Solve the following equations.

a $\dfrac{4}{x+1} + \dfrac{5}{x+2} = 2$

$\dfrac{4\cancel{(x+1)}(x+2)}{\cancel{(x+1)}} + \dfrac{5(x+1)\cancel{(x+2)}}{\cancel{(x+2)}} = 2(x+1)(x+2)$

$4x + 8 + 5x + 5 = 2[x^2 + 3x + 2]$

$9x + 13 = 2x^2 + 6x + 4$

$0 = 2x^2 + 6x + 4 - 9x - 13$

$0 = 2x^2 - 3x - 9$

$2 \times -9 = -18$

$+3 - 6$

$0 = 2x^2 + 3x - 6x - 9$

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

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

Either $x - 3 = 0$ or $2x + 3 = 0$

$\underline{x = 3}$

$2x = -3$

$\underline{x = -\frac{3}{2}}$

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b $\frac{18}{4x-1} - \frac{1}{x+1} = 1$

$$\frac{18\cancel{(4x-1)}(x+1)}{\cancel{(4x-1)}} - \frac{1(4x-1)\cancel{(x+1)}}{\cancel{(x+1)}} = 1(4x-1)(x+1)$$

$$18x + 18 - 4x + 1 = 4x^2 - x + 4x - 1$$

$$14x + 19 = 4x^2 + 3x - 1$$

$$0 = 4x^2 + 3x - 1 - 14x - 19$$

$$0 = 4x^2 - 11x - 20$$

4×-20
$= -80$
$+5 \quad -16$

$$0 = 4x^2 + 5x - 16x - 20$$

$$0 = x(4x+5) - 4(4x+5)$$

$$0 = (x-4)(4x+5)$$

Either $x - 4 = 0$ or $4x + 5 = 0$

$x = 4$

$4x = -5$

$x = -\frac{5}{4}$

---

c $\frac{2x-1}{2} - \frac{6}{x+1} = 1$

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

$$2x^2 + 2x - x - 1 - 12 = 2x + 2$$

$$2x^2 + x - 13 - 2x - 2 = 0$$

$$2x^2 - x - 15 = 0$$

$2x - 15$
$= -30$
$+5 \quad -6$

$$2x^2 + 5x - 6x - 15 = 0$$
$$x(2x+5) - 3(2x+5) = 0$$
$$(x-3)(2x+5) = 0$$

Either $x - 3 = 0$ or $2x + 5 = 0$

$\underline{x = 3}$ $\qquad 2x = -5$

$\underline{x = -\frac{5}{2}}$

---

d $\dfrac{3}{2x-1} - \dfrac{4}{3x-1} = 1$

$$\frac{3\cancel{(2x-1)}(3x-1)}{\cancel{(2x-1)}} - \frac{4(2x-1)\cancel{(3x-1)}}{\cancel{(3x-1)}} = 1(2x-1)(3x-1)$$

$$9x - 3 - 8x + 4 = 6x^2 - 3x - 2x + 1$$
$$x + 1 = 6x^2 - 5x + 1$$
$$0 = 6x^2 - 5x + 1 - x - 1$$
$$0 = 6x^2 - 6x$$
$$0 = 6x(x-1)$$

$\Rightarrow$ $\underline{x = 0}$ or $x - 1 = 0$

$\underline{x = 1}$

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8 Simplify the following expressions.

a $\dfrac{x^2 + 2x - 3}{2x^2 + 7x + 3} = \dfrac{\cancel{(x+3)}(x-1)}{\cancel{(x+3)}(2x+1)} = \dfrac{x-1}{2x+1}$

$x^2 + 2x - 3$

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

$2x^2 + 7x + 3$

$2 \times 3 = 6$

$+1 + 6$

$= 2x^2 + x + 6x + 3$

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

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

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b $\dfrac{4x^2 - 1}{2x^2 + 5x - 3} = \dfrac{(2x+1)\cancel{(2x-1)}}{(x+3)\cancel{(2x-1)}} = \dfrac{2x+1}{x+3}$

$4x^2 - 1$

$= (2x)^2 - 1^2$

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

$2x^2 + 5x - 3$

$2 \times -3 = -6$

$-1 + 6$

$= 2x^2 - x + 6x - 3$

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

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

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c $\dfrac{6x^2 + x - 2}{9x^2 - 4} = \dfrac{\cancel{(3x+2)}(2x-1)}{\cancel{(3x+2)}(3x-2)} = \dfrac{2x-1}{3x-2}$

$9x^2 - 4$

$= (3x)^2 - 2^2$

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

$6x^2 + x - 2$

$6 \times -2 = -12$

$-3 + 4$

$= 6x^2 - 3x + 4x - 2$

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

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

---

d $\dfrac{4x^2 + x - 3}{4x^2 - 7x + 3} = \dfrac{(x+1)\cancel{(4x-3)}}{(x-1)\cancel{(4x-3)}} = \dfrac{x+1}{x-1}$

$4x^2 + x - 3$

$4 \times -3 = -12$

$-3 + 4$

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

$= x(4x-3) + 1(4x-3)$

$= (x+1)(4x-3)$

$4x^2 - 7x + 3$

$4 \times 3 = 12$

$-3 \quad -4$

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

$= x(4x-3) - 1(4x-3)$

$= (x-1)(4x-3)$