# ALGEBRAIC FRACTIONS

# SIMPLIFYING RATIONAL EXPRESSIONS

**Question 1**

Simplify the following algebraic fractions.

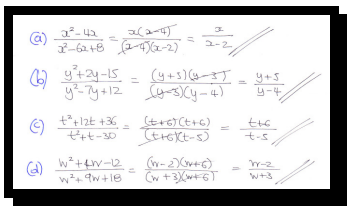
**a)** $\dfrac{x^2-4x}{x^2-6x+8}$

**b)** $\dfrac{y^2+2y-15}{y^2-7y+12}$

**c)** $\dfrac{t^2+12t+36}{t^2+t-30}$

**d)** $\dfrac{w^2+4w-12}{w^2+9w+18}$

$$\boxed{\frac{x}{x-2}}, \quad \boxed{\frac{y+5}{y-4}}, \quad \boxed{\frac{t+6}{t-5}}, \quad \boxed{\frac{w-2}{w-3}}$$



**Question 2**

Simplify the following algebraic fractions.

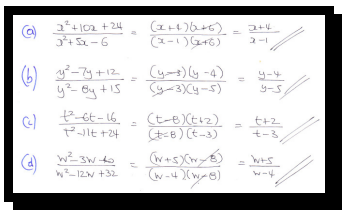
**a)** $\dfrac{x^2+10x+24}{x^2+5x-6}$

**b)** $\dfrac{y^2-7y+12}{y^2-8y+15}$

**c)** $\dfrac{t^2-6t-16}{t^2-11t+24}$

**d)** $\dfrac{w^2-3w-40}{w^2-12w+32}$

$$\boxed{\frac{x+4}{x-1}}, \quad \boxed{\frac{y-4}{y-5}}, \quad \boxed{\frac{t+2}{t-3}}, \quad \boxed{\frac{w+5}{w-4}}$$



**Question 3**

Simplify the following algebraic fractions:

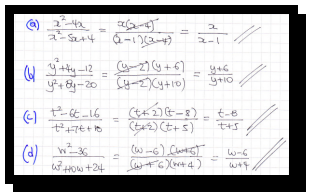
**a)** $\dfrac{x^2-4x}{x^2-5x+4}$

**b)** $\dfrac{y^2+4y-12}{y^2+8y-20}$

**c)** $\dfrac{t^2-6t-16}{t^2+7t+10}$

**d)** $\dfrac{w^2-36}{w^2+10w+24}$

$\boxed{\dfrac{x}{x-1}}$, $\boxed{\dfrac{y+6}{y+10}}$, $\boxed{\dfrac{t-8}{t+5}}$, $\boxed{\dfrac{w-6}{w+4}}$



**Question 4**

Simplify the following algebraic fractions:

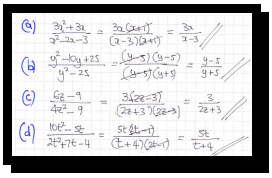
**a)** $\dfrac{3x^2+3x}{x^2-2x-3}$

**b)** $\dfrac{y^2-10y+25}{y^2-25}$

**c)** $\dfrac{6z-9}{4z^2-9}$

**d)** $\dfrac{10t^2-5t}{2t^2+7t-4}$

$\boxed{\dfrac{3x}{x-3}}$, $\boxed{\dfrac{y-5}{y+5}}$, $\boxed{\dfrac{3}{2z+3}}$, $\boxed{\dfrac{5t}{t+4}}$



**Question 5**

Simplify the following algebraic fractions:

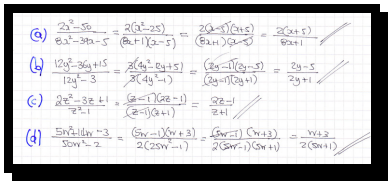
**a)** $\dfrac{2x^2-50}{8x^2-39x-5}$

**b)** $\dfrac{12y^2-36y+15}{12y^2-3}$

**c)** $\dfrac{2z^2-3z+1}{z^2-1}$

**d)** $\dfrac{5w^2+14w-3}{50w^2-2}$

$\boxed{\dfrac{2(x+5)}{8x-1}}$, $\boxed{\dfrac{2y-5}{2y+1}}$, $\boxed{\dfrac{2z-1}{z+1}}$, $\boxed{\dfrac{w+3}{2(5w+1)}}$



**Question 6**

Simplify the following algebraic fractions:

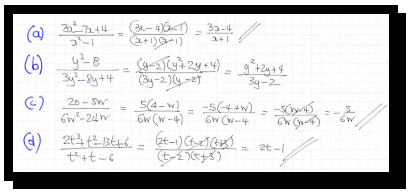
**a)** $\dfrac{3x^2-7x+4}{x^2-1}$

**b)** $\dfrac{y^3-8}{3y^2-8y+4}$

**c)** $\dfrac{20-5w}{6w^2-24w}$

**d)** $\dfrac{2t^3+t^2-13t+6}{t^2+t-6}$

$\boxed{\dfrac{3x-4}{x+1}}$, $\boxed{\dfrac{y^2+2y+4}{3y-2}}$, $\boxed{-\dfrac{5}{6w}}$, $\boxed{2t+1}$



**Question 7**

Simplify the following algebraic fractions:

**a)** $\dfrac{4x^2+4x-3}{4x^3-x}$

**b)** $\dfrac{y^3-8}{3y^2-8y+4}$

**c)** $\dfrac{20-5w}{6w^2-24w}$

**d)** $\dfrac{(2t+1)(3t^2-6t)}{6t^3-19t^2+9t+10}$

$\boxed{\dfrac{2x+3}{x(2x+1)}}$, $\boxed{\dfrac{y^2+2y+4}{3y-2}}$, $\boxed{-\dfrac{5}{6w}}$, $\boxed{\dfrac{3t}{3t-5}}$

# ADDING ALGEBRAIC FRACTIONS

**Question 1**

Simplify the following expressions into a single fraction.

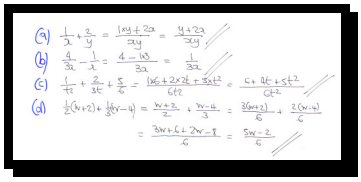
**a)** $\dfrac{1}{x}+\dfrac{2}{y}$

**b)** $\dfrac{4}{3x}-\dfrac{1}{x}$

**c)** $\dfrac{1}{t^2}+\dfrac{2}{3t}+\dfrac{5}{6}$

**d)** $\dfrac{1}{2}(w+2)+\dfrac{1}{3}(w-4)$

$$\boxed{\frac{2x+y}{xy}}, \quad \boxed{\frac{1}{3x}}, \quad \boxed{\frac{5t^2+4t+6}{6t^2}}, \quad \boxed{\frac{5w-2}{6}}$$



**Question 2**

Simplify the following expressions into a single fraction.

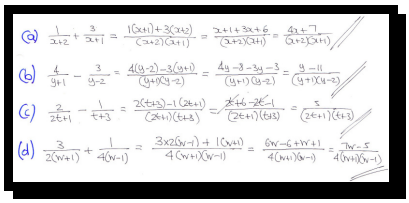
**a)** $\dfrac{1}{x+2}+\dfrac{3}{x+1}$

**b)** $\dfrac{4}{y+1}-\dfrac{3}{y-2}$

**c)** $\dfrac{2}{2t+1}-\dfrac{1}{t+3}$

**d)** $\dfrac{3}{2(w+1)}+\dfrac{1}{4(w-1)}$

$$\boxed{\frac{4x+7}{(x+1)(x+2)}},\ \boxed{\frac{y-11}{(y+1)(y-2)}},\ \boxed{\frac{5}{(2t+1)(t+3)}},\ \boxed{\frac{7w-5}{4(w+1)(w-1)}}$$



**Question 3**

Simplify the following into a single fraction.

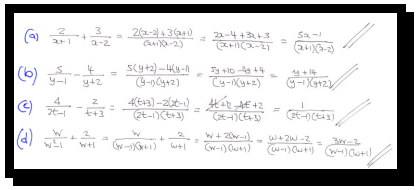
**a)** $\dfrac{2}{x+1}+\dfrac{3}{x-2}$

**b)** $\dfrac{5}{y-1}-\dfrac{4}{y+2}$

**c)** $\dfrac{4}{2t-1}-\dfrac{2}{t+3}$

**d)** $\dfrac{w}{w^2-1}+\dfrac{2}{w+1}$

$$\boxed{\frac{5x-1}{(x+1)(x-2)}},\ \boxed{\frac{y+14}{(y+1)(y-2)}},\ \boxed{\frac{14}{(2t-1)(t+3)}},\ \boxed{\frac{3w-2}{(w+1)(w-1)}}$$



**Question 4**

Simplify the following algebraic expressions giving your final answer as a single fraction in its simplest form.

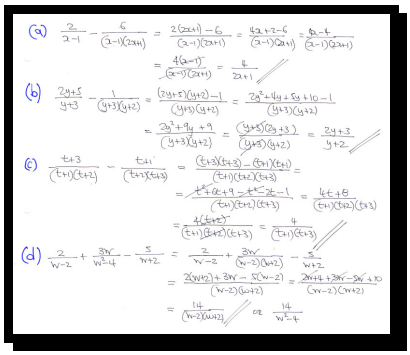
**a)** $\dfrac{2}{x-1}-\dfrac{6}{(x-1)(2x+1)}$

**b)** $\dfrac{2y+5}{y+3}-\dfrac{1}{(y+3)(y+2)}$

**c)** $\dfrac{t+3}{(t+1)(t+2)}-\dfrac{t+1}{(t+2)(t+3)}$

**d)** $\dfrac{2}{w-2}+\dfrac{3w}{w^2-4}-\dfrac{5}{w+2}$

$$\boxed{\frac{4}{2x+1}},\ \boxed{\frac{2y+3}{y+2}},\ \boxed{\frac{4}{(t+1)(t+3)}},\ \boxed{\frac{14}{(w-2)(w+2)}=\frac{14}{w^2-4}}$$



**Question 5**

Simplify the following algebraic expressions giving your final answer as a single fraction in its simplest form.

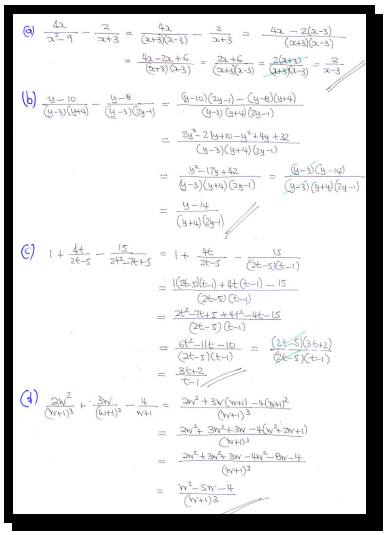
**a)** $\dfrac{4x}{x^2-9}-\dfrac{2}{x+3}$

**b)** $\dfrac{y-10}{(y-3)(y+4)}-\dfrac{y-8}{(y-3)(2y-1)}$

**c)** $1+\dfrac{4t}{2t-5}-\dfrac{15}{2t^2-7t+5}$

**d)** $\dfrac{2w^2}{(w+1)^3}+\dfrac{3w}{(w+1)^2}-\dfrac{4}{w+1}$

$\boxed{\dfrac{2}{x-3}}$, $\boxed{\dfrac{y-14}{(y+4)(2y-1)}}$, $\boxed{\dfrac{3t+2}{t-1}}$, $\boxed{\dfrac{w^2-5w-4}{(w+1)^3}}$



**Question 6**

Simplify the following algebraic expressions giving your final answer as a single fraction in its simplest form.

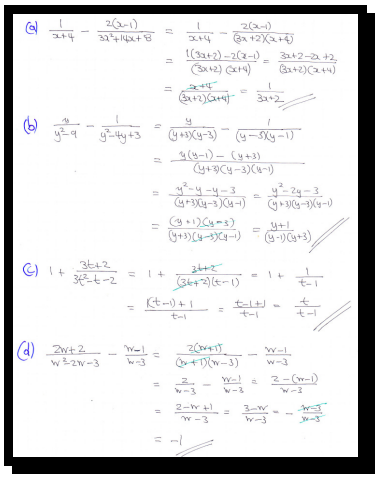
**a)** $\dfrac{1}{x+4}-\dfrac{2(x-1)}{3x^2+14x+8}$

**b)** $\dfrac{y}{y^2-9}-\dfrac{1}{y^2-4y+3}$

**c)** $1+\dfrac{3t+2}{3t^2-t-2}$

**d)** $\dfrac{2w+2}{w^2-2w-3}-\dfrac{w+1}{w-3}$

$\boxed{\dfrac{1}{3x+2}}$, $\boxed{\dfrac{y+1}{(y-1)(y+3)}}$, $\boxed{\dfrac{t}{t-1}}$, $\boxed{-1}$



**Question 7**

Prove that

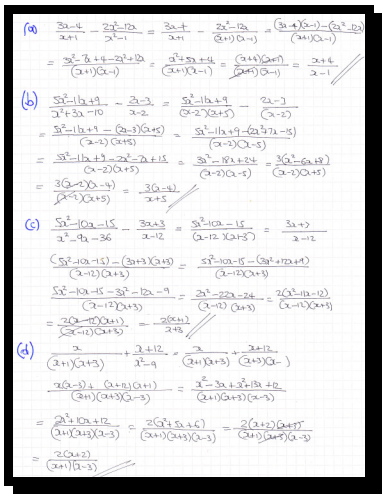
**a)** $\dfrac{3x-4}{x+1}-\dfrac{2x^2-12x}{x^2-1}\equiv\dfrac{x+4}{x-1}$

**b)** $\dfrac{5x^2-11x+9}{x^2+3x-10}-\dfrac{2x-3}{x-2}\equiv\dfrac{3(x-4)}{x+5}$

**c)** $\dfrac{5x^2-10x-15}{x^2-9x-36}-\dfrac{3x+3}{x-12}\equiv\dfrac{2(x+1)}{x+3}$

**d)** $\dfrac{x}{(x+1)(x+3)}+\dfrac{x+12}{x^2-9}\equiv\dfrac{2(x+2)}{(x+1)(x-3)}$

proof



**Question 8**

Prove that

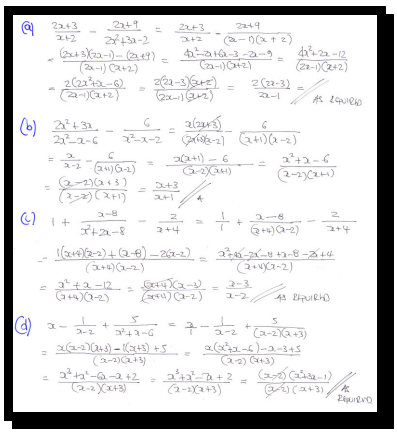
**a)** $\dfrac{2x+3}{x+2}-\dfrac{2x+9}{2x^2+3x-2}\equiv\dfrac{2(2x-3)}{2x-1}$

**b)** $\dfrac{2x^2+3x}{2x^2-x-6}-\dfrac{6}{x^2-x-2}\equiv\dfrac{x+3}{x+1}$

**c)** $1+\dfrac{x-8}{x^2+2x-8}-\dfrac{2}{x+4}\equiv\dfrac{x-3}{x-2}$

**d)** $x-\dfrac{1}{x-2}+\dfrac{5}{x^2+x-6}\equiv\dfrac{x^2+3x-1}{x+3}$

proof



**Question 9**

Prove that

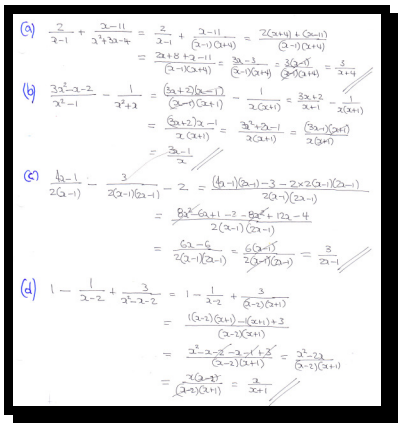
**a)** $\dfrac{2}{x-1}+\dfrac{x-11}{x^2+3x-4}\equiv\dfrac{3}{x+4}$

**b)** $\dfrac{3x^2-x-2}{x^2-1}-\dfrac{1}{x^2+x}\equiv\dfrac{3x-1}{x}$

**c)** $\dfrac{4x-1}{2(x-1)}-\dfrac{3}{2(x-1)(2x-1)}-2\equiv\dfrac{3}{2x-1}$

**d)** $1-\dfrac{1}{x-2}+\dfrac{3}{x^2-x-2}\equiv\dfrac{x}{x+1}$

proof



**Question 10**

Prove that

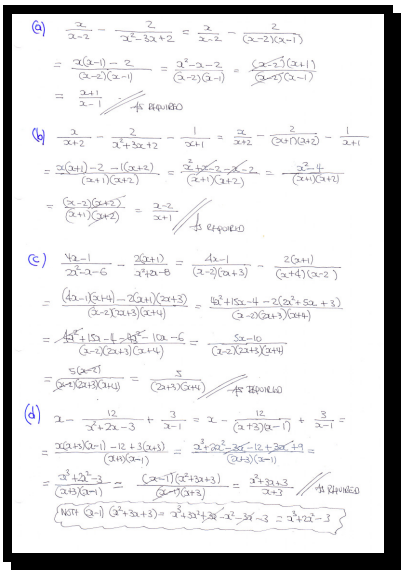
**a)** $\dfrac{x}{x-2}-\dfrac{2}{x^2-3x+2}\equiv\dfrac{x+1}{x-1}$

**b)** $\dfrac{x}{x+2}-\dfrac{2}{x^2+3x+2}-\dfrac{1}{x+1}\equiv\dfrac{x-2}{x+1}$

**c)** $\dfrac{4x-1}{2x^2-x-6}-\dfrac{2(x+1)}{x^2+2x-8}\equiv\dfrac{5}{(2x+3)(x+4)}$

**d)** $x-\dfrac{12}{x^2+2x-3}+\dfrac{3}{x-1}\equiv\dfrac{x^2+3x+3}{x+3}$

proof



# ALGEBRAIC DIVISIONS

**Question 1**

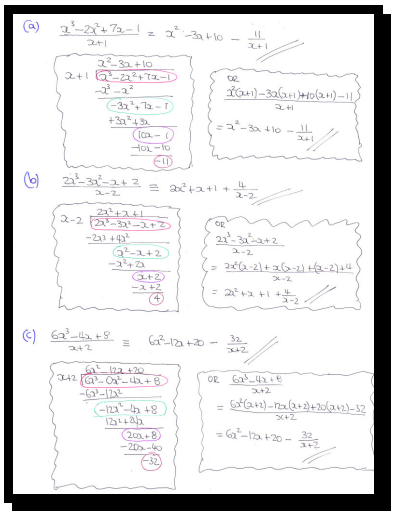
Find the values of the constants in the each of the following identities.

**a)** $\dfrac{x^3-2x^2+7x-1}{x+1} \equiv ax^2+bx+c+\dfrac{d}{x+1}$

**b)** $\dfrac{2x^3-3x^2-x+2}{x-2} \equiv Ax^2+Bx+C+\dfrac{D}{x-2}$

**c)** $\dfrac{6x^3-4x+8}{x+2} \equiv Px^2+Qx+R+\dfrac{S}{x+2}$

$\boxed{(a,b,c,d)=(1,-3,10,-11)}$, $\boxed{(A,B,C,D)=(2,1,1,4)}$, $\boxed{(P,Q,R,S)=(6,12,20,-32)}$



**Question 2**

Find the values of the constants in the each of the following identities.

**a)** $\dfrac{x^3+2x^2-3x+1}{x-2} \equiv ax^2+bx+c+\dfrac{d}{x-2}$

**b)** $\dfrac{2x^3-x^2+3x-2}{x+1} \equiv Ax^2+Bx+C+\dfrac{D}{x+1}$

**c)** $\dfrac{2x^3-3x^2+x-4}{x-1} \equiv Px^2+Qx+R+\dfrac{S}{x-1}$

$\boxed{(a,b,c,d)=(1,4,5,11)}$, $\boxed{(A,B,C,D)=(2,-3,6,-8)}$, $\boxed{(P,Q,R,S)=(2,-1,0,-4)}$

**Question 3**

Find the values of the constants in the each of the following identities.

**a)** $\dfrac{3x^3-x^2-20x+31}{x+3} \equiv ax^2+bx+c+\dfrac{d}{x+3}$

**b)** $\dfrac{4x^3-7x^2-30x-21}{x-4} \equiv Ax^2+Bx+C+\dfrac{D}{x-4}$

**c)** $\dfrac{2x^3-7x+2}{x+1} \equiv Px^2+Qx+R+\dfrac{S}{x+1}$

$\boxed{(a,b,c,d)=(3,-10,10,1)}$, $\boxed{(A,B,C,D)=(4,9,6,3)}$, $\boxed{(P,Q,R,S)=(2,-2,-5,7)}$

**Question 4**

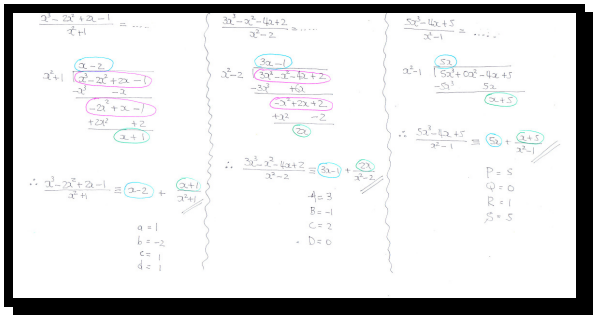
Find the values of the constants in the each of the following identities.

**a)** $\dfrac{x^3-2x^2+2x-1}{x^2+1} \equiv ax+b+\dfrac{cx+d}{x^2+1}$

**b)** $\dfrac{3x^3-x^2-4x+2}{x^2-2} \equiv Ax+B+\dfrac{Cx+D}{x^2-2}$

**c)** $\dfrac{5x^3-4x+5}{x^2-1} \equiv Px+Q+\dfrac{Rx+S}{x^2-1}$

$\boxed{(a,b,c,d)=(1,-2,1,1)}$, $\boxed{(A,B,C,D)=(3,-1,2,0)}$, $\boxed{(P,Q,R,S)=(5,0,1,5)}$



**Question 5**

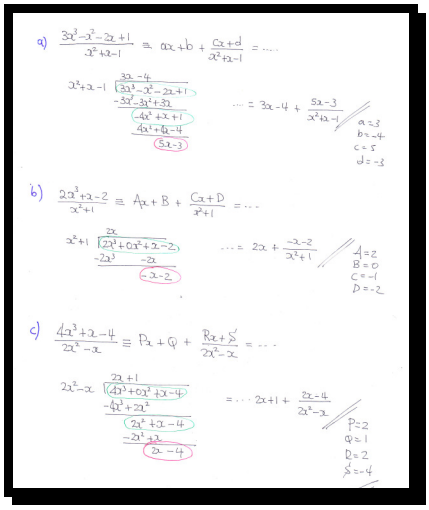
Find the values of the constants in the each of the following identities.

**a)** $\dfrac{3x^3-x^2-2x+1}{x^2+x-1} \equiv ax+b+\dfrac{cx+d}{x^2+x-1}$

**b)** $\dfrac{2x^3+x-2}{x^2+1} \equiv Ax+B+\dfrac{Cx+D}{x^2+1}$

**c)** $\dfrac{4x^3+x-4}{2x^2-x} \equiv Px+Q+\dfrac{Rx+S}{2x^2-x}$

$\boxed{(a,b,c,d)=(3,-4,5,-3)}$, $\boxed{(A,B,C,D)=(2,0,-1,-2)}$, $\boxed{(P,Q,R,S)=(2,1,2,-4)}$



**Question 6**

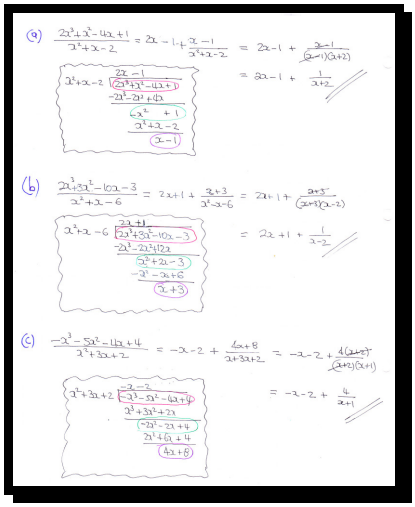
Find the values of the constants in the each of the following identities.

**a)** $\dfrac{2x^3+x^2-4x+1}{x^2+x-2} \equiv ax+b+\dfrac{c}{x+d}$

**b)** $\dfrac{2x^3+3x^2-10x-3}{x^2+x-6} \equiv Ax+B+\dfrac{C}{x+D}$

**c)** $\dfrac{-x^3-5x^2-4x+4}{x^2+3x+2} \equiv Px+Q+\dfrac{R}{x+S}$

$\boxed{(a,b,c,d)=(2,-1,1,2)}$, $\boxed{(A,B,C,D)=(2,1,1,-2)}$, $\boxed{(P,Q,R,S)=(-1,-2,4,1)}$



# MULTIPLICATION AND DIVISION OF ALGEBRAIC FRACTIONS

**Question 1**

Simplify the following algebraic expressions giving your final answer as a single fraction in its simplest form:

**a)** $\dfrac{2x^3+x^2}{x^2-4}\times\dfrac{x-2}{2x^2-5x-3}$

**b)** $\dfrac{18y^2-8}{12y^2}\times\dfrac{3y^2+9y}{3y^2+11y+6}$

**c)** $\dfrac{t^3+1}{2t^2+7t+5}\times\dfrac{4t^2-25}{4t^2-t+1}$

$\boxed{\dfrac{x^2}{(x+2)(x+3)}}$, $\boxed{\dfrac{3y-2}{2y}}$ $\boxed{2t-5}$

**Question 2**

Simplify the following algebraic expressions giving your final answer as a single fraction in its simplest form:

**a)** $\dfrac{2x}{2x^2+3x-5}\div\dfrac{x^3}{x^2-x}$

**b)** $\dfrac{y^2-8y+15}{(y-5)^2}\div\dfrac{y^2-9}{2y^2+6y}$

$\boxed{\dfrac{2}{x(2x+5)}}$, $\boxed{\dfrac{2y}{y-5}}$

**Question 3**

Simplify the following algebraic expressions giving your final answer as a single fraction in its simplest form:

**a)** $\dfrac{\dfrac{x^2+x-6}{x^2-9}}{\dfrac{x-2}{4}}$

**b)** $\dfrac{\dfrac{3}{x+4}+\dfrac{2}{x-1}}{\dfrac{x+1}{x-1}}$

**c)** $\dfrac{(2x+1)(2x-5)+4(2x-1)}{\dfrac{2x+3}{2x+1}}$

$\boxed{\frac{4}{x-3}}$, $\boxed{\frac{5}{x+4}}$, $\boxed{4x^2-4x-3}$

# PARTIAL FRACTIONS

**Question 1**

Express each of the following into partial fractions.

**a)** $\dfrac{6x}{(x-1)(x+2)}$

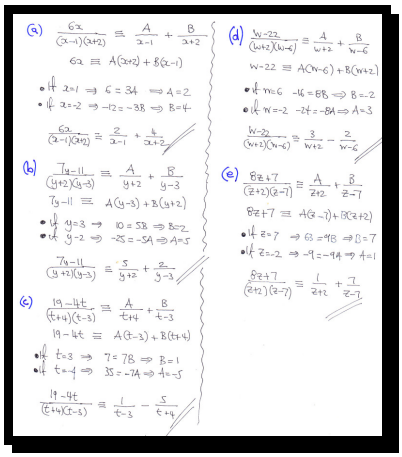
**b)** $\dfrac{7y-11}{(y+2)(y-3)}$

**c)** $\dfrac{19-4t}{(t+4)(t-3)}$

**d)** $\dfrac{w-22}{(w+2)(w-6)}$

**e)** $\dfrac{8z+7}{(z+2)(z-7)}$

$\boxed{\dfrac{2}{x-1}+\dfrac{4}{x+2}}$, $\boxed{\dfrac{2}{y-3}+\dfrac{5}{y+2}}$, $\boxed{\dfrac{1}{t-3}-\dfrac{5}{t+4}}$, $\boxed{\dfrac{3}{w+2}-\dfrac{2}{w-6}}$, $\boxed{\dfrac{1}{z+2}+\dfrac{7}{z-7}}$



**Question 2**

Express each of the following into partial fractions.

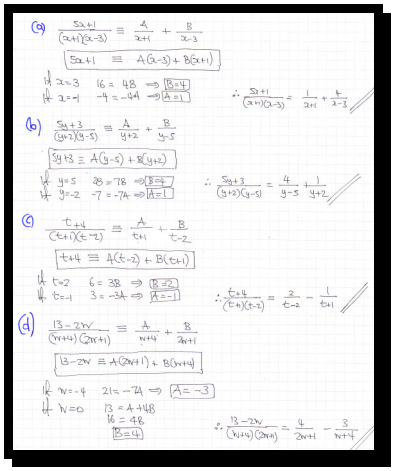
**a)** $\dfrac{5x+1}{(x+1)(x-3)}$

**b)** $\dfrac{5y+3}{(y+2)(y-5)}$

**c)** $\dfrac{t+4}{(t+1)(t-2)}$

**d)** $\dfrac{13-2w}{(w+4)(2w+1)}$

$\boxed{\dfrac{1}{x+1}+\dfrac{4}{x-3}}$, $\boxed{\dfrac{4}{y-5}+\dfrac{1}{y+2}}$, $\boxed{\dfrac{2}{t-2}-\dfrac{1}{t+1}}$, $\boxed{\dfrac{4}{2w+1}-\dfrac{3}{w+4}}$



**Question 3**

Express each of the following into partial fractions.

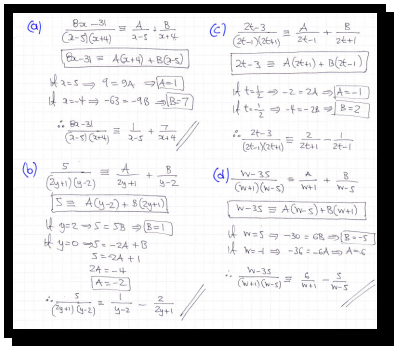
**a)** $\dfrac{8x-31}{(x-5)(x+4)}$

**b)** $\dfrac{5}{(2y+1)(y-2)}$

**c)** $\dfrac{2t-3}{(2t-1)(2t+1)}$

**d)** $\dfrac{w-35}{(w+1)(w-5)}$

$\boxed{\dfrac{7}{x+4}+\dfrac{1}{x-5}}$, $\boxed{\dfrac{2}{2y+1}-\dfrac{1}{y-2}}$, $\boxed{\dfrac{2}{2t+1}-\dfrac{1}{2t-1}}$, $\boxed{\dfrac{6}{w+1}-\dfrac{5}{w-5}}$



**Question 4**

Express each of the following into partial fractions.

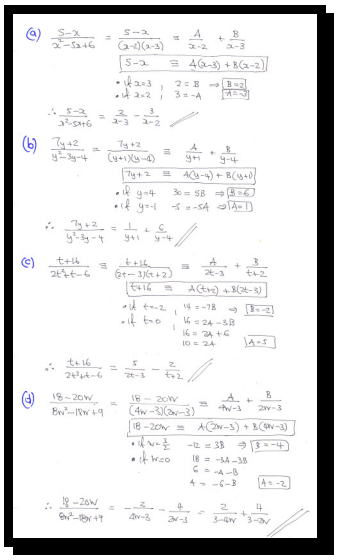
**a)** $\dfrac{5-x}{x^2-5x+6}$

**b)** $\dfrac{7y+2}{y^2-3y-4}$

**c)** $\dfrac{t+16}{2t^2+t-6}$

**d)** $\dfrac{18-20w}{8w^2-18w+9}$

$\boxed{\dfrac{2}{x-3}-\dfrac{3}{x-2}}$, $\boxed{\dfrac{6}{y-4}+\dfrac{1}{y+1}}$, $\boxed{\dfrac{5}{2t-3}-\dfrac{2}{t+2}}$, $\boxed{\dfrac{2}{3-4w}+\dfrac{4}{3-2w}}$



**Question 5**

Express each of the following into partial fractions.

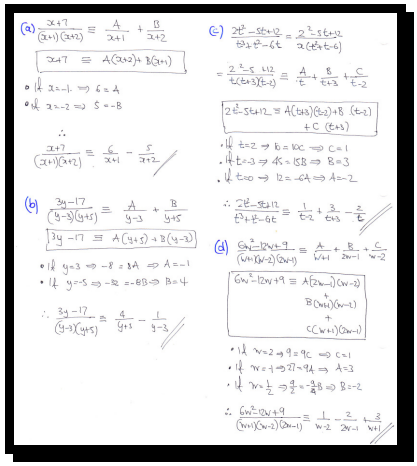
**a)** $\dfrac{x+7}{(x+1)(x+2)}$

**b)** $\dfrac{3y-17}{(y-3)(y+5)}$

**c)** $\dfrac{2t^2-5t+12}{t^3+t^2-6t}$

**d)** $\dfrac{6w^2-12w+9}{(w+1)(2w-1)(w-2)}$

$\boxed{\dfrac{6}{x+1}-\dfrac{5}{x+2}}$, $\boxed{\dfrac{4}{y+5}-\dfrac{1}{y-3}}$, $\boxed{\dfrac{1}{t-2}-\dfrac{2}{t}+\dfrac{3}{t+3}}$, $\boxed{\dfrac{1}{w-2}-\dfrac{2}{2w-1}+\dfrac{3}{w+1}}$



**Question 6**

Express each of the following into partial fractions.

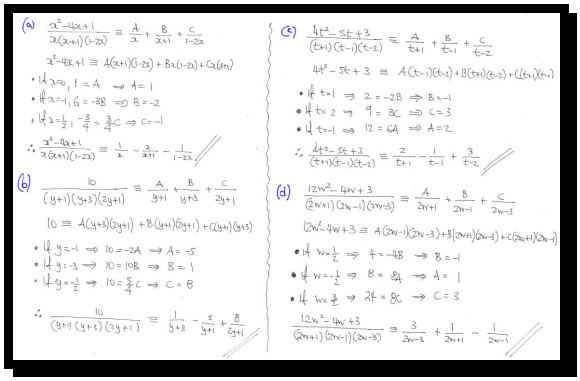
**a)** $\dfrac{x^2-4x+1}{x(x+1)(1-2x)}$

**b)** $\dfrac{10}{(y+1)(y+3)(2y+1)}$

**c)** $\dfrac{4t^2-5t+3}{(t+1)(t-1)(t-2)}$

**d)** $\dfrac{12w^2-4w+3}{(2w+1)(2w-1)(2w-3)}$

$\boxed{\dfrac{1}{x}+\dfrac{1}{2x-1}-\dfrac{2}{x+1}}$, $\boxed{\dfrac{1}{y+3}-\dfrac{5}{y+1}+\dfrac{8}{2y+1}}$, $\boxed{\dfrac{2}{t+1}-\dfrac{1}{t-1}+\dfrac{3}{t-2}}$, $\boxed{\dfrac{1}{2w+1}-\dfrac{1}{2w-1}+\dfrac{3}{2w-3}}$



**Question 7**

Express each of the following into partial fractions.

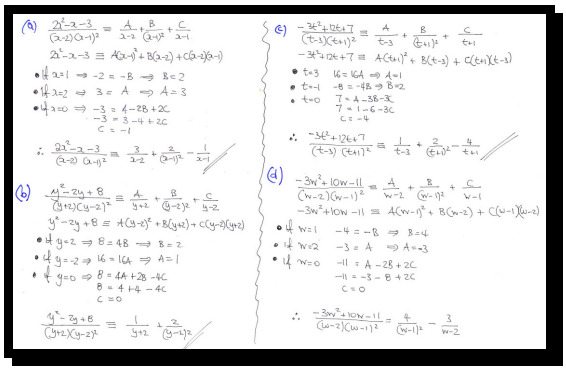
**a)** $\dfrac{2x^2-x-3}{(x-2)(x-1)^2}$

**b)** $\dfrac{y^2-2y+8}{(y+2)(y-2)^2}$

**c)** $\dfrac{-3t^2+12t+7}{(t-3)(t+1)^2}$

**d)** $\dfrac{-3w^2+10w-11}{(w-2)(w-1)^2}$

$$\boxed{\frac{3}{x-2}-\frac{1}{x-1}+\frac{2}{(x-1)^2}}, \quad \boxed{\frac{2}{(y-2)^2}+\frac{1}{y+2}}, \quad \boxed{\frac{1}{t-3}-\frac{4}{t+1}+\frac{2}{(t+1)^2}}, \quad \boxed{\frac{4}{(w-1)^2}-\frac{3}{w-2}}$$



**Question 8**

Express each of the following into partial fractions.

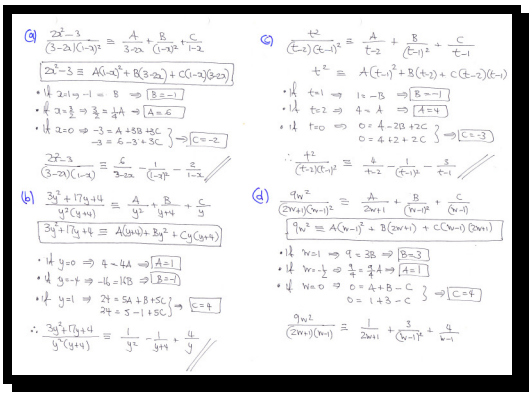
**a)** $\dfrac{2x^2-3}{(3-2x)(1-x)^2}$

**b)** $\dfrac{3y^2+17y+4}{y^2(y+4)}$

**c)** $\dfrac{t^2}{(t-2)(t-1)^2}$

**d)** $\dfrac{9w^2}{(2w+1)(w-1)^2}$

$\boxed{\dfrac{6}{3-2x}-\dfrac{2}{1-x}-\dfrac{1}{(1-x)^2}}$, $\boxed{\dfrac{1}{y^2}+\dfrac{4}{y}-\dfrac{1}{y+4}}$, $\boxed{\dfrac{4}{t-2}-\dfrac{1}{(t-1)^2}-\dfrac{3}{t-1}}$, $\boxed{\dfrac{4}{w-1}+\dfrac{3}{(w-1)^2}+\dfrac{1}{2w+1}}$



**Question 9**

Express each of the following into partial fractions.

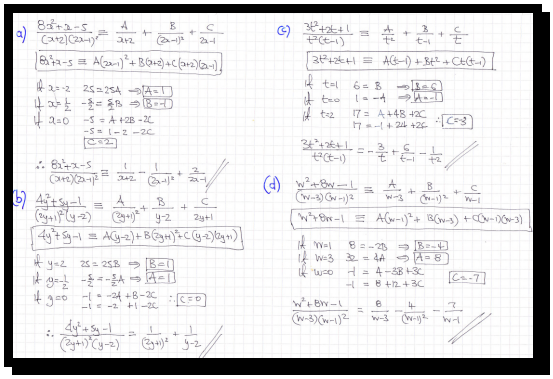
**a)** $\dfrac{8x^2+x-5}{(x+2)(2x-1)^2}$

**b)** $\dfrac{4y^2+5y-1}{(2y+1)^2(y-2)}$

**c)** $\dfrac{3t^2+2t+1}{t^2(t-1)}$

**d)** $\dfrac{w^2+8w-1}{(w-3)(w-1)^2}$

$\boxed{\dfrac{1}{x+2}+\dfrac{2}{2x-1}-\dfrac{1}{(2x-1)^2}}$, $\boxed{\dfrac{1}{(2y+1)^2}+\dfrac{1}{y-2}}$, $\boxed{\dfrac{6}{t-1}-\dfrac{1}{t^2}-\dfrac{3}{t}}$, $\boxed{\dfrac{8}{w-3}-\dfrac{4}{(w-1)^2}-\dfrac{7}{w-1}}$



**Question 10**

Express each of the following into partial fractions.

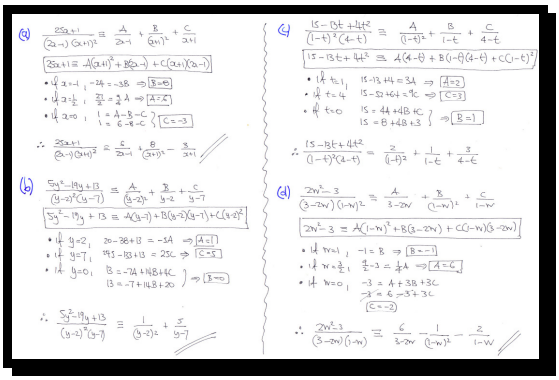
**a)** $\dfrac{25x+1}{(2x-1)(x+1)^2}$

**b)** $\dfrac{5y^2-19y+13}{(y-2)^2(y-7)}$

**c)** $\dfrac{15-13t+4t^2}{(1-t)^2(4-t)}$

**d)** $\dfrac{2w^2-3}{(3-2w)(1-w)^2}$

$$\boxed{\frac{6}{2x-1}-\frac{3}{x+1}+\frac{8}{(x+1)^2}}, \quad \boxed{\frac{1}{(y-2)^2}+\frac{5}{y-7}}, \quad \boxed{\frac{3}{4-t}+\frac{1}{1-t}+\frac{2}{(1-t)^2}}, \quad \boxed{\frac{6}{3-2w}-\frac{1}{(1-w)^2}-\frac{2}{1-w}}$$



**Question 11**

Express each of the following into partial fractions.

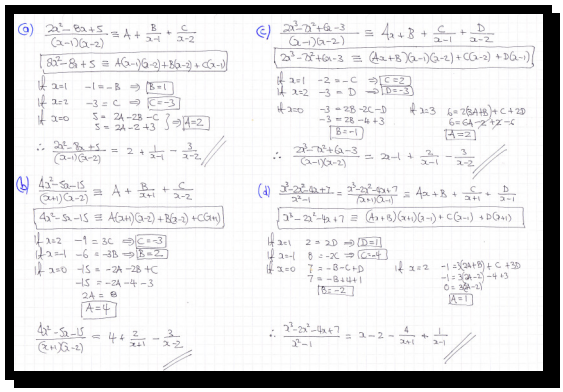
**a)** $\dfrac{2x^2-8x+5}{(x-1)(x-2)}$

**b)** $\dfrac{4x^2-5x-15}{(x+1)(x-2)}$

**c)** $\dfrac{2x^3-7x^2+6x-3}{(x-1)(x-2)}$

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

$\boxed{2+\frac{1}{x-1}-\frac{3}{x-2}}$, $\boxed{4+\frac{2}{x+1}-\frac{3}{x-2}}$, $\boxed{2x-1+\frac{2}{x-1}-\frac{3}{x-2}}$, $\boxed{x-2+\frac{1}{x-1}-\frac{4}{x+1}}$



**Question 12**

Express each of the following into partial fractions.

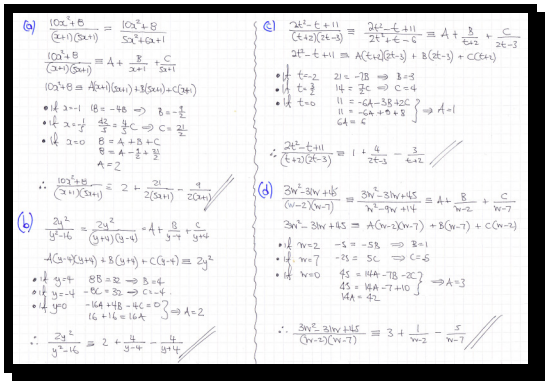
**a)** $\dfrac{10x^2+8}{(x+1)(5x+1)}$

**b)** $\dfrac{2y^2}{y^2-16}$

**c)** $\dfrac{2t^2-t+11}{(t+2)(2t-3)}$

**d)** $\dfrac{3w^2-31w+45}{(w-2)(w-7)}$

$\boxed{2+\dfrac{21}{2(5x+1)}-\dfrac{9}{2(x+1)}}$, $\boxed{2+\dfrac{4}{y-4}-\dfrac{4}{y+4}}$, $\boxed{1+\dfrac{4}{2t-3}-\dfrac{3}{t+2}}$, $\boxed{3+\dfrac{1}{w-2}-\dfrac{5}{w-7}}$



**Question 13**

Express each of the following into partial fractions.

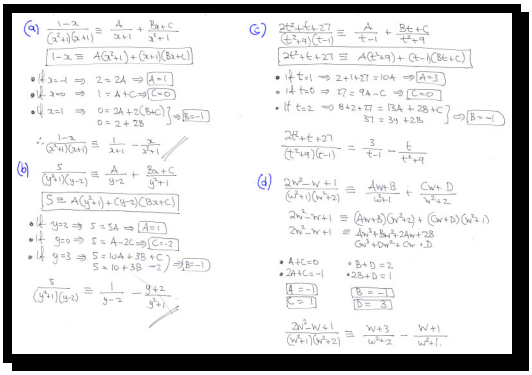
**a)** $\dfrac{1-x}{\left(x^2+1\right)(x+1)}$

**b)** $\dfrac{5}{\left(y^2+1\right)(y-2)}$

**c)** $\dfrac{2t^2+t+27}{\left(t^2+9\right)(t-1)}$

**d)** $\dfrac{2w^2-w+1}{\left(w^2+1\right)\left(w^2+2\right)}$

$$\boxed{\frac{1}{x+1}-\frac{x}{x^2+1}},\ \boxed{\frac{1}{y-2}-\frac{y+2}{y^2+1}},\ \boxed{\frac{3}{t-1}-\frac{t}{t^2+9}},\ \boxed{\frac{w+3}{w^2+2}-\frac{w+1}{w^2+1}}$$



**Question 14**

Express each of the following into partial fractions.

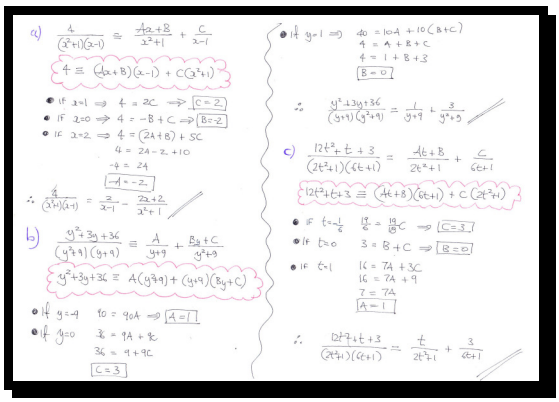
**a)** $\dfrac{4}{\left(x^2+1\right)(x-1)}$

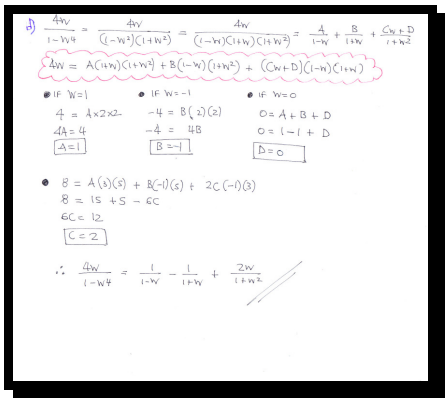
**b)** $\dfrac{y^2+3y+36}{\left(y^2+9\right)(y+9)}$

**c)** $\dfrac{12t^2+t+3}{\left(2t^2+1\right)(6t+1)}$

**d)** $\dfrac{4w}{1-w^4}$

$$\boxed{\frac{2}{x-1}-\frac{2x+2}{x^2+1}}\,,\quad \boxed{\frac{1}{y+9}+\frac{3}{y^2+9}}\,,\quad \boxed{\frac{3}{6t+1}+\frac{t}{2t^2+1}}\,,\quad \boxed{\frac{1}{1-w}-\frac{1}{1+w}+\frac{2w}{1+w^2}}$$





**Question 15**

Express each of the following into partial fractions.

**a)** $\dfrac{1-4x}{\left(x^2+3\right)(x-2)^2}$

**b)** $\dfrac{y^2+3y+36}{\left(y^2+9\right)(y+9)}$

**c)** $\dfrac{12t^2+t+3}{\left(2t^2+1\right)(6t+1)}$

**d)** $\dfrac{4w}{1-w^4}$

$\boxed{\dfrac{1}{x^2+3}-\dfrac{1}{(x-2)^2}}$, $\boxed{\dfrac{1}{y+9}+\dfrac{1}{y^2+9}}$, $\boxed{\dfrac{3}{6t+1}+\dfrac{t}{2t^2+1}}$, $\boxed{\dfrac{1}{1-w}-\dfrac{1}{1+w}+\dfrac{2w}{1+w^2}}$

**Question 16**

Express each of the following into partial fractions.

**a)** $\dfrac{4x^3-3x^2+4}{(2x-1)\left(x^2+1\right)}$

**b)** $\dfrac{y^2+3y+36}{\left(y^2+9\right)(y+9)}$

**c)** $\dfrac{12t^2+t+3}{\left(2t^2+1\right)(6t+1)}$

**d)** $\dfrac{4w}{1-w^4}$

$2+\dfrac{3}{2x-1}-\dfrac{2x+3}{x^2+1}$, $\dfrac{1}{y+9}+\dfrac{1}{y^2+9}$, $\dfrac{3}{6t+1}+\dfrac{t}{2t^2+1}$, $\dfrac{1}{1-w}-\dfrac{1}{1+w}+\dfrac{2w}{1+w^2}$