

Fractions

1) $\frac{3}{2} \cdot \frac{4}{9}$

2) $\frac{2}{30} \div \frac{4}{15}$

3) $\frac{3}{8} - \frac{1}{6}$

4) $\frac{3}{4} + \frac{5}{8}$

$\frac{1\cancel{8} \cdot 4\cancel{2}}{1\cancel{2} \cdot 9\cancel{3}} = \frac{2}{3}$

$\frac{1\cancel{2} \cdot 15\cancel{1}}{2\cancel{3}\cancel{0} \cdot 4\cancel{2}} = \frac{1}{4}$

$\frac{6}{6} \cdot \frac{3}{8} - \frac{1}{6} \cdot \frac{8}{8}$

$\frac{2}{2} \cdot \frac{3}{4} + \frac{5}{8}$

$\frac{18}{48} - \frac{8}{48} = \frac{10}{48}$

$\frac{6}{8} + \frac{5}{8} = \frac{11}{8}$

$\frac{5}{24}$

or
 $1\frac{3}{8}$

or

$\frac{3}{3} \cdot \frac{3}{8} - \frac{1}{6} \cdot \frac{4}{4}$

$\frac{9}{24} - \frac{4}{24} = \frac{5}{24}$

Factoring

1) $6x^4 - 21x^2$

$3x^2(2x^2 - 7)$
GCF

2) $6x^2 - 11x - 10$

~~$-15 \quad 4$~~
 ~~$-11 \quad 6$~~
 $(x - \frac{15}{6})(x + \frac{4}{6})$
 $(x - \frac{5}{2})(x + \frac{2}{3})$
 $(2x - 5)(3x + 2)$

3) $x^2 + xy - 12y^2$

~~$-12y^2 \quad -3y$~~
 ~~$4y \quad 1y$~~
 $(x + 4y)(x - 3y)$

4) $3x^2 - 30x + 48$

$3(x^2 - 10x + 16)$
 ~~$-8 \quad -2$~~
 ~~$16 \quad -10$~~
 $3(x - 8)(x - 2)$

5) $49x^8 - y^4$

$(7x^4)^2 - (y^2)^2$
 $(7x^4 - y^2)(7x^4 + y^2)$

6) $25x^2 + 40x + 64$

$(\frac{5x}{a})^2 \quad (\frac{8}{b})^2$
 $2(5x)(8)$
 $80x$
 Not Possible

7) $216 - x^3$

$(\frac{6}{a})^3 - (\frac{x}{b})^3$
 $(6 - x)(36 + 6x + x^2)$
 $(-x + 6)(x^2 + 6x + 36)$

8) $125x^{12} + 8y^3$

$(\frac{5x^4}{a})^3 + (\frac{2y}{b})^3$
 $(5x^4 + 2y)(25y^8 + 10x^4y + 4y^2)$

9-4 Rational Expressions

$$1) \frac{(-7x^{-6}y^{-1})^2}{14x^4y^2}$$

$$\frac{(-7)^2 (x^{-6})^2 (y^{-1})^2}{14x^4y^2}$$

$$\frac{49x^{-12}y^{-2}}{14x^4y^2}$$

$-12-4=-16$
 $-2-2=-4$

$$\frac{7x^{-16}y^{-4}}{2x^4y^4} = \boxed{\frac{7}{2x^{16}y^4}}$$

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

$$\frac{4(x^2-1)}{5(x+1)}$$

$$\frac{4(x-1)(x+1)}{5(x+1)}$$

$$\boxed{\frac{4(x-1)}{5}}$$

$$3) \frac{3x^{-6}}{4y^3} \div \frac{12y^{-2}}{10x}$$

$$\frac{3x^{-6}}{4y^3} \cdot \frac{5x}{4xy^{-2}}$$

$$\frac{5x^{-5}}{8y^1} = \boxed{\frac{5}{8x^5y}}$$

$$4) \frac{4-x^2}{4x} \div \frac{3x-6}{x^2+2x}$$

$$\frac{-1(x^2-4)}{4x} \cdot \frac{x(x+2)}{3(x-2)}$$

$$\frac{-1(x+2)(x-2)(x+2)}{12(x-2)}$$

$$\boxed{\frac{-1(x+2)^2}{12}}$$

$$5) \frac{x-2}{x^2-x-2} \cdot (1-x)$$

$$\frac{x-2}{(x-2)(x+1)} \cdot \frac{1-x}{1}$$

$$\boxed{\frac{1-x}{x+1}}$$

$$6) \frac{30x^5}{x^2-25} \div \frac{6x^5}{2x-10}$$

$$\frac{30x^5}{(x-5)(x+5)} \div \frac{6x^5}{2(x-5)}$$

$$\frac{5x^5}{(x-5)(x+5)} \cdot \frac{2(x-5)}{6x^5}$$

$$\frac{5 \cdot 2}{x+5} = \boxed{\frac{10}{x+5}}$$

9-5 Adding and Subtracting Rational Expressions

1) $\frac{8x^2}{2x} - \frac{6x}{2x}$

$$\frac{8x^2 - 6x}{2x}$$

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

$$\boxed{4x-3}$$

2) $\frac{x^2+2}{x^2-2x-15} - \frac{1}{x+3}$

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

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

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

3) $\frac{2}{x^2+5x+4} + \frac{x-1}{x^2-16}$

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

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

$$\boxed{\frac{x^2 + 2x - 9}{(x-4)(x+4)(x+1)}}$$

9-6 Solving Rational Equations

$$1) \frac{x-3}{x+1} = \frac{3}{x+2}$$

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

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

$$\begin{array}{r} x^2 - x - 6 \\ -3x - 3 \\ \hline \end{array}$$

$$x^2 - 4x - 9 = 0$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-9)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{16 + 36}}{2}$$

$$x = \frac{4 \pm \sqrt{52}}{2} = \frac{4 \pm 2\sqrt{13}}{2}$$

$$\boxed{x = 2 \pm \sqrt{13}}$$

$$2) \frac{3x}{10} - 2 = \frac{1}{5x}$$

$$\cancel{10x} \cdot \frac{3x}{\cancel{10}} - \cancel{10x} \cdot 2 = \frac{1 \cdot \cancel{10x}}{\cancel{5x}}$$

$$3x^2 - 20x = 2$$

$$\begin{array}{r} 3x^2 - 20x = 2 \\ -2 \quad -2 \\ \hline \end{array}$$

$$3x^2 - 20x - 2 = 0$$

$$x = \frac{20 \pm \sqrt{400 + 24}}{6}$$

$$x = \frac{20 \pm \sqrt{424}}{6}$$

$$x = \frac{20 \pm 2\sqrt{106}}{6}$$

$$\boxed{x = \frac{10 \pm \sqrt{106}}{3}}$$

$$3) \frac{2}{x^2 - 2x - 3} - \frac{3}{x+1} = \frac{1}{x-3}$$

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

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

$$2 - 3x + 9 = x + 1$$

$$\begin{array}{r} -3x + 11 = x + 1 \\ -x \quad -x \\ \hline \end{array}$$

$$\begin{array}{r} -4x + 11 = 1 \\ -11 \quad -11 \\ \hline \end{array}$$

$$\begin{array}{r} +4x = -10 \\ -4 \quad -4 \\ \hline \end{array}$$

$$\boxed{x = \frac{5}{2}}$$