Fractions

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

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

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

$\frac{1\cancel{2}}{2\cancel{30}} \cdot \frac{\cancel{15}1}{\cancel{4}2} = \boxed{\frac{1}{4}}$

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

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

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

$\boxed{\frac{5}{24}}$

or

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

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

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

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

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

or

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

Factoring

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

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

GCF

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

-60, -15, 4, -11

$(x - 15)(x + 4)$

$6 \quad 6$

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

$(2x - 5)(3x + 2)$

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

$-12y^2$, $4y$, $-3y$, $1y$

$(x + 4y)(x - 3y)$

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

$3(x^2 - 10x + 16)$

16, -8, -2, -10

$3(x - 8)(x - 2)$

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

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

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

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

$(5x)^2 \quad (8)^2$

$a \quad b$

$2(5x)(8)$

$80x$

Not Possible

7) $216 - x^3$

$(6)^2 - (x)^3$

$a \quad b$

$(6 - x)(36 + 6x + x^2)$

or

$(-x + 6)(x^2 + 6x + 36)$

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

$(5x^4)^3 + (2y)^3$

$a \quad b$

$(5x^4 + 2y)(25y^8 + 10x^4y + 4y^2$

9-4 Rational Expressions

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

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

$\dfrac{49x^{-12}y^{-2}}{14x^4y^2}$ $\quad -12-4=-16$ $\quad -2-2=-4$

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

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

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

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

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

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

$\dfrac{1\,3x^{-6}}{2\,4y^3} \cdot \dfrac{5\,10x}{4\,12y^{-2}}$

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

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

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

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

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

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

$\dfrac{x-2}{(x-2)(x+1)} \cdot \dfrac{1-x}{1}$ $\quad -2,\ -1,\ 1$

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

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

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

$\dfrac{5\,30x^5}{(x-5)(x+5)} \cdot \dfrac{2(x-5)}{6x^5}$

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

9-5 Adding and Subtracting Rational Expressions

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

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

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

$4x-3$

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

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

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

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

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

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

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

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

9-6 Solving Rational Equations

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

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

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

$-3x-3 \quad -3x-3$

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

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

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

$x=\frac{4\pm\sqrt{52}}{2}=\frac{4\pm2\sqrt{13}}{2}$

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

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

$10x\cdot\frac{3x}{10}-10x\cdot2=\frac{1\cdot10x}{5x}$

$3x^2-20x=2$

$-2 \quad -2$

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

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

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

$x=\frac{20\pm2\sqrt{106}}{6}$

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

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

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

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

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

$-3x+11=x+1$

$-x \quad -x$

$-4x+11=1$

$-11 \quad -11$

$-4x=-10$

$\frac{-4x}{-4}=\frac{-10}{-4}$

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