

Section P.5

Factor:  $x^2(x+3) + 5(x+3) = \boxed{(x+3)(x^2+5)}$

$$\underbrace{x^3 + 4x^2}_{x^2} + \underbrace{3x + 12}_3 = x^2(x+4) + 3(x+4)$$

$$= \boxed{(x+4)(x^2+3)}$$

Factoring trinomials:

$$1 \cdot x^2 + 6x + 8 = (x+4)(x+2)$$

$$\left. \begin{array}{l} A \cdot C = 8 \\ A + C = 6 \end{array} \right\} \begin{array}{l} A = 4 \\ C = 2 \end{array}$$

$$x^2 + 3x - 18 = \overset{A}{(x+6)} \overset{C}{(x-3)}$$

$$\left. \begin{array}{l} A \cdot C = -18 \\ A + C = 3 \end{array} \right\} \begin{array}{l} A = 6 \\ C = -3 \end{array}$$

Factor:

$$8x^2 - 10x - 3$$

$$8 \cdot (-3) = -24 = A \cdot C \left. \begin{array}{l} -2, 12 \\ -12, 2 \end{array} \right\}$$

$$\left. \begin{array}{l} 8 \cdot (-3) = -24 = A \cdot C \\ \rightarrow -10 = A + C \end{array} \right\} \begin{array}{l} -12, 2 \\ A = -12 \\ C = 2 \end{array}$$

$$8x^2 - 10x - 3 = 8x^2 - 12x + 2x - 3$$

$$= 4x(2x-3) + (2x-3) = \boxed{(2x-3)(4x+1)}$$

$$2x^2 - 7xy + 3y^2 = 2x^2 - 7yx + 3y^2$$

$$\left. \begin{array}{l} 2 \cdot 3y^2 = 6y^2 = A \cdot C \\ -7y = A + C \end{array} \right\} \begin{array}{l} 2, 3 \\ -6, -1 \\ A = -1y \\ C = -6y \end{array}$$

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

$$= 2x(x-3y) - y(x-3y) = \boxed{(x-3y)(2x-y)}$$

Ex:

$$a^2 - b^2 = (a-b)(a+b)$$

Factor:

$$81x^2 - 49 = (9x)^2 - 7^2 = \boxed{(9x-7)(9x+7)}$$

$a = 9x$

$$b = 7$$

$$x^2 + 6x + 9 = (x+3)(x+3) = \boxed{(x+3)^2}$$

$$\left. \begin{array}{l} A \cdot C = 9 \\ A + C = 6 \end{array} \right\} \begin{array}{l} A = 3 \\ C = 3 \end{array}$$

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)(a^2 - ab + b^2) = a^3 - \cancel{a^2b} + \cancel{ab^2} + \cancel{a^2b} - \cancel{ab^2} + b^3 = a^3 + b^3$$

$$\boxed{(a-b)(a^2 + ab + b^2)} = a^3 + \cancel{a^2b} + \cancel{ab^2} - \cancel{a^2b} - \cancel{ab^2} - b^3 = \boxed{a^3 - b^3}$$

Factor:

$$x^3 + 8 = x^3 + 2^3 = (x+2)(x^2 - 2x + 2^2) = \boxed{(x+2)(x^2 - 2x + 4)}$$

$$\begin{array}{l} a = x \\ b = 2 \end{array}$$

$$64x^3 - 125 = 4^3x^3 - 5^3 = (4x)^3 - 5^3 = (4x-5)((4x)^2 + 4x \cdot 5 + 5^2)$$

$$\begin{array}{l} a = 4x \\ b = 5 \end{array}$$

$$= \boxed{(4x-5)(16x^2 + 20x + 25)}$$

Factor:

Factor:

$$x(x+1)^{-3/4} + (x+1)^{1/4} = (x+1)^{-3/4} \left[ x + (x+1)^{1/4 - (-3/4)} \right]$$

$$x(x+1) + (x+1)^2 = (x+1) \left[ x(x+1) + (x+1)^2 \right] \quad \frac{1}{4} - \left(-\frac{3}{4}\right)$$

$$\frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$$

$$= (x+1)^{-3/4} (x + (x+1))$$
$$= \boxed{(x+1)^{-3/4} (2x+1)}$$

## Section P.6

$$\text{Ex: } \frac{x-7}{x-1} \cdot \frac{x^2-1}{3x-21} = \frac{\cancel{x-7}}{\cancel{x-1}} \cdot \frac{(x-1)(x+1)}{3(\cancel{x-7})} = \frac{1}{1} \cdot \frac{x+1}{3}$$
$$= \boxed{\frac{x+1}{3}}$$

$$\text{Ex: } \frac{x^2-2x-8}{x^2-9} \div \frac{x-4}{x+3} = \frac{(x-4)(x+2)}{x^2-9} \cdot \frac{x+3}{x-4}$$
$$(x-3)(x+3)$$

$$= \frac{(\cancel{x-4})(x+2)}{(x-3)(\cancel{x+3})} \cdot \frac{\cancel{x+3}}{\cancel{x-4}} = \frac{x+2}{x-3}, \quad x \neq 3, -3, 4$$

$$= \frac{x}{(x-3)(x+3)} \cdot \frac{x+3}{x-3} = x-3, \quad x \neq -3, 3$$

$$\frac{x+3}{x+3} \cdot \frac{x+2}{2x-3} - \frac{4 \cdot \frac{x^2+2x+3x+6}{2x-3}}{(x+3)(x+2)} - \frac{8x-12}{(2x-3)(x+3)}$$

$$= \frac{x^2+5x+6 - (8x-12)}{(2x-3)(x+3)} = \frac{x^2+5x+6-8x+12}{(2x-3)(x+3)}$$

$$= \frac{x^2-3x+18}{(2x-3)(x+3)}, \quad x \neq -3, x \neq \frac{3}{2}$$

$$2x-3=0$$

$$2x=3$$

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

Simplify:

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

$$3 = \frac{3}{1}$$

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

$$= \boxed{\frac{-1}{x(x+h)}}$$

## Section P.3

$$2x + 3x = 5x$$

$$7\sqrt{11} + 8\sqrt{11} = 15\sqrt{11}$$

$$\sqrt{5x} - 7\sqrt{5x} = -6\sqrt{5x}$$

Simplify:  $\sqrt{\frac{100}{9}} = \frac{\sqrt{100}}{\sqrt{9}} = \boxed{\frac{10}{3}}$

equation  
↓  
 $x^2 = 4$

$$\sqrt{x^2} = \sqrt{4}$$

$$|x| = 2$$

$$x = \pm 2$$

Rationalize denominator:

$$\frac{5}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{5\sqrt{3}}{\sqrt{9}} = \boxed{\frac{5\sqrt{3}}{3}}$$

$$\frac{6}{\sqrt{12}} \cdot \frac{\sqrt{12}}{\sqrt{12}} = \frac{6\sqrt{12}}{12} = \frac{\sqrt{12}}{2} = \cancel{\sqrt{\frac{12}{2}}} = \sqrt{\frac{12}{4}} = \boxed{\sqrt{3}}$$

Simplify:  $\sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = \boxed{2\sqrt{6}}$

$$\sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9} \cdot \sqrt{2} = \boxed{3\sqrt{2}}$$

$$\sqrt[3]{(-3)^4} = (-3)^{\frac{4}{3}} = (-3)^{1+\frac{1}{3}} = (-3)^1 \cdot (-3)^{\frac{1}{3}} = \boxed{-3 \cdot \sqrt[3]{-3}}$$

$$x^{a+b} = x^a \cdot x^b$$