Problem 1. Factor the following

i) $49x^2 - 14xy^2 + 28yx$

ii) $20a^4 - 15a^2b^3 + 10b^4$

iii) $p^2 + 7pq - 18q^2$

iv) $x^8 - 8x^4 + 12$

v) $-3x^3 + 3x^2 + 6x$

vi) $x^2 - 11xy + 28y^2$

vii) $2x^2 - 4x + xy - 2y$

viii) $5x^2 - 10x - 40$

ix) $k^4 - 11 + 28k^2$

x) $2x^5 + x^4 - 2x - 1$

xi) $3h^4 + 24h^3 + 21h^2$

xii) $y^2x - 3y^2 - 4x + 12$

Problem 2. A rectangle has area of $x^2 + 5xy - 24y^2$ and a length of $x - 3y$. What is the width of the rectangle?

Problem 3. Simplify each expression.

i) $\dfrac{24n}{(n+6)} \cdot \dfrac{(n+6)}{12(n+9)}$

ii) $\dfrac{(s+7)(s-10)}{s+7} \cdot \dfrac{3}{(s-2)(s+7)}$

iii) $\dfrac{12b+12}{b^2+10b+16} \cdot \dfrac{b+8}{12b+12}$

iv) $\dfrac{z^2+10z+24}{(z+4)} \cdot \dfrac{z+6}{9}$

v) $\dfrac{y^2+13y+42}{x+7} \cdot \dfrac{y+6}{3}$

Problem 4. Simplify each expression

i) $\dfrac{x-9}{(x^2-9)} \div \dfrac{x-9}{5x^2(x+3)}$

ii) $\dfrac{8n}{7n^5} \div \dfrac{2n}{9n^4}$

iii) $\dfrac{r^2+2r-63}{r-10} \div \dfrac{r^2-11r+28}{r-10}$

iv) $\dfrac{9}{9p+18} \div \dfrac{1}{p-4}$

v) $\dfrac{3v-1}{7v^2-58v-45} \div \dfrac{3v-1}{7v^2-2v-5}$

vi) $\dfrac{25x-30}{7x-14} \div \dfrac{25x^2-10x-24}{35x+28}$

Problem 5. Simplify each expression

i) $\dfrac{5}{x^2y} + \dfrac{3}{14xy^3}$

ii) $\dfrac{x}{x+5} - \dfrac{2}{x-3}$

iii) $\dfrac{5}{x^2-5x} - \dfrac{x}{5x-25}$

iv) $x - \dfrac{1}{x} - \dfrac{x^2}{x-y}$

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

vi) $\dfrac{3}{x^2-7x+6} + \dfrac{-3}{x^2-9}$

vii) $\dfrac{1}{x+1} - \dfrac{x}{x-2} + \dfrac{x^2+2}{x^2-x-2}$