1) $3n^2 - 14n - 5$

$$\frac{3n^2}{n} + \frac{n}{n} - \frac{15n}{-5} - \frac{5}{-5}$$

$$\underbrace{n(3n+1)}_{3n+1} - \underbrace{5(3n+1)}_{3n+1}$$

$$\boxed{(3n+1)(n-5)}$$

$$15$$
$$\begin{array}{cc} +1 & -15 \\ \hline 3 & 5 \end{array}$$

2) $\frac{14y^2}{7y} - \frac{35y}{7y}$

$$7y[2y - 5]$$

3) $x^2 \overset{\text{sum}}{-} 25x + 54$

$$\boxed{Prime}$$

$$54$$
$$\begin{array}{cc} 1 & 54 \\ \hline 2 & 27 \\ \hline 3 & 18 \\ \hline 6 & 9 \end{array}$$

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

$$2[3x^2 + 4x - 4]$$

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

$$\underbrace{x(3x-2)}_{3x-2} + \underbrace{2(3x-2)}_{3x-2}$$

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

$$12$$
$$\begin{array}{cc} 1 & 12 \\ \hline -2 & +6 \\ \hline 3 & 4 \end{array}$$

5) $\frac{8x^4y^3}{2xy} + \frac{10x^2y}{2xy} + \frac{6xy^4}{2xy}$

$$\boxed{2xy\left[4x^3y^2 + 5x + 3y^3\right]}$$

6) $64r^2 - 9$

$$\boxed{(8r+3)(8r-3)}$$

7) $x^2 + 13x + 30$

$$\boxed{(x+3)(x+10)}$$

$$30$$
$$\begin{array}{cc} 1 & 30 \\ \hline 2 & 15 \\ \hline +3 & +10 \\ \hline 5 & 6 \end{array}$$

8) $\frac{k^2}{k} - \frac{7k}{k} + \frac{km}{m} - \frac{7m}{m}$

$$\underbrace{k(k-7)}_{k-7} + \underbrace{m(k-7)}_{k-7}$$

$$\boxed{(k-7)(k+m)}$$

9) $\dfrac{7m^2}{7} - \dfrac{42m}{7} + \dfrac{56}{7}$

$7\left[m^2 - 6m + 8 \right]$

$7(m-2)(m-4)$

$\begin{array}{cc} & 8 \\ 1 & 8 \\ -2 & -4 \end{array}$

10) $\dfrac{12}{4} + \dfrac{4a}{4} - \dfrac{9b}{-3b} - \dfrac{3ab}{-3b}$

$\dfrac{4(3+a)}{3+a} - \dfrac{3b(3+a)}{3+a}$

$(3+a)(4-3b)$

11) $3x^2 \overbrace{- 14x - 15}^{\text{c diff.}}$

Prime

$\begin{array}{cc} & 45 \\ 1 & 45 \\ 3 & 15 \\ 5 & 9 \end{array}$

12) $81x^2 - 16$

$(9x+4)(9x-4)$

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

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

$\begin{array}{cc} & 12 \\ 1 & 12 \\ 2 & 6 \\ -3 & +4 \end{array}$

14) $\dfrac{24t^9u^7}{2t^5u} + \dfrac{10t^5u^5}{2t^5u} - \dfrac{6t^6u}{2t^5u}$

$2t^5u\left[12t^4u^6 + 5u^4 - 3t \right]$

15) $\dfrac{20x^3}{4x} - \dfrac{12x^2}{4x} - \dfrac{8x}{4x}$

$4x\left[5x^2 - 3x - 2 \right]$

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

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

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

$\begin{array}{cc} & 10 \\ 1 & 10 \\ +2 & -5 \end{array}$

16) $\dfrac{n^5}{n^4} - \dfrac{n^4}{n^4}$

$n^4\left[n - 1 \right]$