

Factor Completely:

$$1) \frac{3}{5x} 15x^2 - \frac{4}{5x} 20x$$

$$5x[3x - 4]$$

$$2) x^2 + 23xy + 42y^2$$

$$(x + 2y)(x + 21y)$$

$$\begin{array}{r} 42 \\ + \quad 42 \\ +2 \quad +21 \\ \hline 3 \quad 14 \\ \hline 6 \quad 7 \end{array}$$

$$3) \frac{2}{3q^2r} 3q^2r^2 - \frac{4}{3q^2r} 12q^3r^2 + \frac{8}{3q^2r} 24q^2r$$

$$3q^2r[q^2r^2 - 4qr + 8]$$

$$4) \frac{2}{2x^3} 2x^5 - \frac{12}{2x^3} 24x^4 - \frac{45}{2x^3} 90x^3$$

$$2x^3[x^2 - 12x - 45]$$

$$2x^3(x + 3)(x - 15)$$

$$\begin{array}{r} 45 \\ + \quad 45 \\ +3 \quad -15 \\ \hline 5 \quad 9 \end{array}$$

$$5) \frac{-2}{-2} a^2 - \frac{30}{-2} a + \frac{32}{-2}$$

$$-2[a^2 + 15a - 16]$$

$$-2(a - 1)(a + 16)$$

$$\begin{array}{r} 16 \\ -1 \quad +16 \\ \hline 2 \quad 8 \\ \hline 4 \quad 4 \end{array}$$

$$6) \frac{8}{8xy} x^8y^6 + \frac{5}{8xy} x^6y^5 - \frac{3}{8xy} 24xy$$

$$8xy[x^8y^6 + 5x^6y^5 - 3]$$

$$7) \frac{3r^3}{3r} - \frac{27r^2}{3r} + \frac{24r}{3r}$$

$$3r[r^2 - 9r + 8]$$

$$3r(r - 1)(r - 8)$$

$$\begin{array}{r} 8 \\ -1 \quad -8 \\ \hline 2 \quad 4 \end{array}$$

$$8) \frac{24x^6}{4x^2} - \frac{12x^5}{4x^2} - \frac{16x^3}{4x^2} + \frac{4x^2}{4x^2}$$

$$4x^2[6x^4 - 3x^3 - 4x + 1]$$

$$9) \frac{-5x^2}{-5} + \frac{20x}{-5} + \frac{60}{-5}$$

$$-5[x^2 - 4x - 12]$$

$$-5(x + 2)(x - 6)$$

$$\begin{array}{r} 12 \\ + \quad 12 \\ +2 \quad -6 \\ \hline 3 \quad 4 \end{array}$$

$$10) t^2 + 41tu + 40u^2$$

$$(t + u)(t + 40u)$$

$$\begin{array}{r} 40 \\ + \quad 40 \\ 2 \quad 20 \\ \hline 4 \quad 10 \\ \hline 5 \quad 8 \end{array}$$

$$11) \frac{6q^4r^4}{3q^2r} - \frac{18q^3r}{3q^2r} + \frac{3q^2r^2}{3q^2r}$$

$$3q^2r [2q^2r^3 - 6q + r]$$

$$12) \frac{-4x^2}{-4} + \frac{40x}{-4} - \frac{84}{-4}$$

$$-4 [x^2 - 10x + 21]$$

$$\begin{array}{r} 21 \\ \hline 1 \quad 21 \\ -3 \quad -7 \end{array}$$

$$-4(x-3)(x-7)$$

$$13) x^2 - 19xy + 48y^2$$

48

$$\begin{array}{r} \hline 1 \quad 48 \\ 2 \quad 24 \\ -3 \quad -16 \\ 4 \quad 12 \\ \hline 6 \quad 8 \end{array}$$

$$(x-3y)(x-16y)$$

$$14) \frac{14k^3}{7k} + \frac{21k}{7k}$$

$$7k [2k^2 + 3]$$

$$15) \frac{x^3}{x} - \frac{17x^2}{x} + \frac{60x}{x}$$

$$x [x^2 - 17x + 60]$$

$$\begin{array}{r} 60 \\ \hline 1 \quad 60 \\ 2 \quad 30 \\ 3 \quad 20 \\ 4 \quad 15 \\ -5 \quad -12 \\ \hline 6 \quad 10 \end{array}$$

$$x(x-5)(x-12)$$

$$16) x^2 + 18xy - 63y^2$$

63

$$(x-3y)(x+21y)$$

$$\begin{array}{r} \hline 1 \quad 63 \\ -3 \quad 21 \\ \hline 7 \quad 9 \end{array}$$

$$17) \frac{12x^4}{6x} - \frac{30x^3}{6x} - \frac{6x^2}{6x} + \frac{6x}{6x}$$

$$6x [2x^3 - 5x^2 - x + 1]$$

$$18) \frac{3x^4}{3x^2} - \frac{24x^3}{3x^2} + \frac{36x^2}{3x^2}$$

$$3x^2 [x^2 - 8x + 12]$$

12

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

$$\begin{array}{r} \hline 1 \quad 12 \\ -2 \quad -6 \\ \hline 3 \quad 4 \end{array}$$

$$19) \frac{5x^4y^4}{5xy^4} + \frac{30x^3y^5}{5xy^4} - \frac{20xy^6}{5xy^4}$$

$$5xy^4 [x^3 + 6x^2y - 4y^2]$$

$$20) \frac{-2v^2}{-2} - \frac{16v}{-2} + \frac{66}{-2}$$

$$-2 [v^2 + 8v - 33]$$

33

$$-2(v-3)(v+11)$$

$$\begin{array}{r} \hline 1 \quad 33 \\ -3 \quad 11 \end{array}$$