



4. a)  $4x(3x + 7) - 8x(2x - 4)$   
 $= 12x^2 + 28x - 16x^2 + 32x$   
 $= -4x^2 + 60x$

b)  $y(3y^2 - 8xy + 4x^2) + 3x(2y - 4xy)$   
 $= 3y^3 - 8xy^2 + 4x^2y + 6xy - 12x^2y$   
 $= 3y^3 - 8xy^2 - 8x^2y + 6xy$

c)  $6(5x - 12) - 9x(2x^2 - 3x + 7)$   
 $= 30x - 72 - 18x^3 + 27x^2 - 63x$   
 $= -18x^3 + 27x^2 - 33x - 72$

d)  $y^2(4y^2 - 8) - 4y(y^3 + 6y)$   
 $= 4y^4 - 8y^2 - 4y^4 - 24y^2$   
 $= -32y^2$

e)  $y(8x + 3y - 4) - (3x + 7y^2)$   
 $= 8xy + 3y^2 - 4y - 3x - 7y^2$   
 $= -4y^2 + 8xy - 3x - 4y$

f)  $4x^2y(3xy - 7x^2 + 8y^2) - 3xy^2(12xy - 8)$   
 $= 12x^3y^2 - 28x^4y + 32x^2y^3 - 36x^2y^3 + 24xy^2$   
 $= 12x^3y^2 - 28x^4y - 4x^2y^3 + 24xy^2$

g)  $11xyz(3x + 4y - 12z) + 3x^2yz$   
 $= 33x^2yz + 44xy^2z - 132xyz^2 + 3x^2yz$   
 $= 36x^2yz + 44xy^2z - 132xyz^2$

h)  $8xy^2(7x^2y - 3xy) + 3(4x^3y^3 - 7xy^3)$   
 $= 56x^3y^3 - 24x^2y^3 + 12x^3y^3 - 21xy^3$   
 $= 68x^3y^3 - 24x^2y^3 - 21xy^3$

i)  $\frac{1}{2}xy(8xy + 12x^2 - 14y^2) - 3x^2(7y^2 - 11xy)$   
 $= 4x^2y^2 + 6x^3y - 7xy^3 - 21x^2y^2 + 33x^3y$   
 $= -17x^2y^2 + 39x^3y - 7xy^3$

j)  $\frac{1}{3x}(6xy + 12x^2y) - \frac{1}{4y}(16y^2x + 24x^2y^2)$   
 $= 2y + 4xy - 4xy - 6x^2y$   
 $= -6x^2y + 2y$

$$5. \quad a) \quad \frac{15x^3+35xy^2-45x^2y}{5x}$$

$$= \frac{15x^3}{5x} + \frac{35xy^2}{5x} - \frac{45x^2y}{5x}$$

$$= 3x^2 + 7y^2 - 9xy$$

$$b) \quad \frac{13xy-26x^2y+39x}{13xy}$$

$$= \frac{13xy}{13xy} - \frac{26x^2y}{13xy} + \frac{39x}{13xy}$$

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

$$c) \quad \frac{-64t^3+48t^2-16t}{8t^2}$$

$$= -\frac{64t^3}{8t^2} + \frac{48t^2}{8t^2} - \frac{16t}{8t^2}$$

$$= -8t + 6 - \frac{2}{t}$$

$$d) \quad \frac{5x^2y+20xy-15}{20}$$

$$= \frac{5x^2y}{20} + \frac{20xy}{20} - \frac{15}{20}$$

$$= \frac{x^2y}{4} + xy - \frac{3}{4}$$

$$e) \quad \frac{16x^2-8x^2}{4x^2-1}$$

$$= \frac{8x^2}{4x^2-1}$$

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

$$= \frac{16x^3-8x^2+24x^4}{8x^3}$$

$$= \frac{16x^3}{8x^3} - \frac{8x^2}{8x^3} + \frac{24x^4}{8x^3}$$

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

$$g) \quad \frac{6a^4b^2+12a^2b^4-18a^2b^2}{2ab(3ab)}$$

$$= \frac{6a^4b^2+12a^2b^4-18a^2b^2}{6a^2b^2}$$

$$= \frac{6a^4b^2}{6a^2b^2} + \frac{12a^2b^4}{6a^2b^2} - \frac{18a^2b^2}{6a^2b^2}$$

$$= a^2 + 2b^2 - 3$$

$$h) \quad \frac{18x^2y^2-36x^4y^2+54x^2y^4-63xy}{3x^2(-3y^2)}$$

$$= \frac{18x^2y^2-36x^4y^2+54x^2y^4-63xy}{-9x^2y^2}$$

$$= \frac{18x^2y^2}{-9x^2y^2} - \frac{36x^4y^2}{-9x^2y^2} + \frac{54x^2y^4}{-9x^2y^2} - \frac{63xy}{-9x^2y^2}$$

$$= -2 + 4x^4 - 6y^2 + \frac{7}{xy}$$

$$i) \quad \frac{-81x^2y^2+21x-15xy+18x^3y+9}{9xy-12xy}$$

$$= \frac{-81x^2y^2+21x-15xy+18x^3y+9}{-3xy}$$

$$= \frac{-81x^2y^2}{-3xy} + \frac{21x}{-3xy} - \frac{15xy}{-3xy} + \frac{18x^3y}{-3xy} + \frac{9}{-3xy}$$

$$= 27xy - \frac{7}{y} + 5 - 6x^2 - \frac{3}{xy}$$

$$j) \quad \frac{24x^3y+64xy-36y^2}{15x^2-9x^2+2x^2}$$

$$= \frac{24x^3y+64xy-36y^2}{8x^2}$$

$$= \frac{24x^3y}{8x^2} + \frac{64xy}{8x^2} - \frac{36y^2}{8x^2}$$

$$= 3xy + \frac{8y}{x} - \frac{9y^2}{2x^2}$$

$$6. \quad a) \quad (4xy^2)^2 + \sqrt[3]{-27x^6}$$

$$= 16x^2y^4 - 3x^2$$

$$b) \quad \sqrt{9x^2y^4 + 16x^2y^4}$$

$$= \sqrt{25x^2y^4}$$

$$= 5xy^2$$

$$c) \quad \sqrt[3]{(5x^2yz^3)^3}$$

$$= 5x^2yz^3$$

$$d) \quad \sqrt{64a^6b^{12}} + \sqrt[3]{64a^6b^{12}}$$

$$= 8a^3b^6 + 4a^2b^4$$

$$e) \quad 3x(\sqrt{9x^4}) + 3x(\sqrt[3]{-27x^6})$$

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

$$= 9x^3 - 9x^3$$

$$= 0$$

$$7. \quad a) \quad 3abc + 1$$

$$= 3(-4)(1)\left(\frac{2}{3}\right) + 1$$

$$= -8 + 1$$

$$= -7$$

$$b) \quad 4a^2 + 7b - 6c + 9abc^2$$

$$= 4(-4)^2 + 7(1) - 6\left(\frac{2}{3}\right) + 9(-4)(1)\left(\frac{2}{3}\right)^2$$

$$= 4(16) + 7 - 4 - 36\left(\frac{4}{9}\right)$$

$$= 64 + 7 - 4 - 16$$

$$= 51$$

$$c) \quad 6a + b(3a - 6c) + 12$$

$$= 6(-4) + 1\left(3(-4) - 6\left(\frac{2}{3}\right)\right) + 12$$

$$= -24 + (-12 - 4) + 12$$

$$= -12 - 16$$

$$= -28$$

$$d) \quad \sqrt{9a^2c - ab}$$

$$= \sqrt{9(-4)^2\left(\frac{2}{3}\right) - (-4)(1)}$$

$$= \sqrt{6(16) + 4}$$

$$= \sqrt{100}$$

$$= 10$$

$$\begin{aligned} \text{e)} \quad & \frac{3a+12b^2-c}{a} \\ &= \frac{3(-4)+12(1)^2-\frac{2}{3}}{-4} \\ &= -\frac{12}{-4} + \frac{12}{-4} - \frac{\frac{2}{3}}{-4} \\ &= 3 - 3 + \frac{1}{6} \\ &= \frac{1}{6} \end{aligned}$$