Note: In this section, we are doing same operations that we did in section R.4 but with factorable expressions. Therefore, don't forget the phrase "factor before canceling".

Additional examples

2) $\frac{5}{6}\bullet\frac{7}{8}$

$$\frac{5}{6}\bullet\frac{7}{8}=\frac{(5)(7)}{(6)(8)}=\frac{35}{48}$$

4) $\frac{3}{8}\div\frac{5}{4}$

$$\frac{3}{8}\div\frac{5}{4}=\left(\frac{3}{8}\right)\left(\frac{4}{5}\right)=\frac{(3)(4)}{(8)(5)}=\frac{(3)(1)}{(2)(5)}=\frac{3}{10}$$

6) $\frac{6}{5}\bullet\frac{10}{36}\div\frac{3}{4}$

$$\frac{6}{5}\bullet\frac{10}{36}\div\frac{3}{4}=\left(\frac{6}{5}\right)\left(\frac{10}{36}\right)\left(\frac{4}{3}\right)=\frac{(6)(10)(4)}{(5)(36)(3)}=\frac{(1)(2)(4)}{(1)(6)(3)}=\frac{(1)(1)(4)}{(1)(3)(3)}=\frac{4}{9}$$

8) $\frac{8x^3}{7y^4}\bullet\frac{14y^6}{16x^2}$

$$\frac{8x^3}{7y^4}\bullet\frac{14y^6}{16x^2}=\left(\frac{8x^3}{7y^4}\right)\left(\frac{14y^6}{16x^2}\right)=\frac{(8x^3)(14y^6)}{(7y^4)(16x^2)}=\frac{(1x)(2y^2)}{(1)(2)}=\frac{(1x)(1y^2)}{(1)(1)}=\frac{y^2}{1}=y^2$$

10) $\frac{8ab^3}{9a^2b}\div\frac{16a^2b^2}{18ab^3}$

$$\frac{8ab^3}{9a^2b}\div\frac{16a^2b^2}{18ab^3}=\left(\frac{8ab^3}{9a^2b}\right)\left(\frac{18ab^3}{16a^2b^2}\right)=\frac{(8ab^3)(18ab^3)}{(9a^2b)(16a^2b^2)}=\frac{(1b)(2b^2)}{(1a)(2a)}=\frac{(1b)(1b^2)}{(1a)(1a)}=\frac{b^3}{a^2}$$

12) $\frac{4x^3}{7y^2}\bullet\frac{6z^5}{5x^6}\div\frac{24z^2}{35x^6}$

$$\frac{4x^3}{7y^2}\bullet\frac{6z^5}{5x^6}\div\frac{24z^2}{35x^6}=\left(\frac{4x^3}{7y^2}\right)\left(\frac{6z^5}{5x^6}\right)\left(\frac{35x^6}{24z^2}\right)=\frac{(4x^3)(6z^5)(35x^6)}{(7y^2)(5x^6)(24z^2)}=\frac{(4x^3)(1z^3)(7)}{(7y^2)(1)(4)}=\frac{(1x^3)(1z^3)(1)}{(1y^2)(1)(1)}=\frac{x^3z^3}{y^2}$$

14) $\frac{x^2-16}{x^2-25}\bullet\frac{x-5}{x-4}$

$$\frac{x^2-16}{x^2-25}\bullet\frac{x-5}{x-4}=\left(\frac{x^2-16}{x^2-25}\right)\left(\frac{x-5}{x-4}\right)=\left(\frac{(x+4)(x-4)}{(x+5)(x-5)}\right)\left(\frac{(x-5)}{(x-4)}\right)=\frac{(x+4)(x-4)(x-5)}{(x+5)(x-5)(x-4)}=\frac{(x+4)(1)(1)}{(x+5)(1)(1)}$$

$$=\frac{(x+4)}{(x+5)}=\frac{x+4}{x+5}$$

16) $\dfrac{y-1}{y^2-y-6}\bullet\dfrac{y^2+5y+6}{y^2-1}$

$$\frac{y-1}{y^2-y-6}\bullet\frac{y^2+5y+6}{y^2-1}=\left(\frac{(y-1)}{(y+2)(y-3)}\right)\left(\frac{(y+3)(y+2)}{(y+1)(y-1)}\right)=\frac{(y-1)(y+3)(y+2)}{(y+2)(y-3)(y+1)(y-1)}$$

$$=\frac{(1)(y+3)(1)}{(1)(y-3)(y+1)(1)}=\frac{(y+3)}{(y-3)(y+1)}=\frac{y+3}{(y-3)(y+1)}$$

18) $\dfrac{x^2+5x+1}{4x-4}\bullet\dfrac{x-1}{x^2+5x+1}$

$$\frac{x^2+5x+1}{4x-4}\bullet\frac{x-1}{x^2+5x+1}=\left(\frac{x^2+5x+1}{4(x-1)}\right)\left(\frac{(x-1)}{x^2+5x+1}\right)=\frac{(x^2+5x+1)(x-1)}{4(x-1)(x^2+5x+1)}=\frac{(1)(1)}{4(1)(1)}=\frac{1}{4}$$

20) $\dfrac{y}{x}\div\dfrac{xy}{xy-1}$

$$\frac{y}{x}\div\frac{xy}{xy-1}=\left(\frac{y}{x}\right)\left(\frac{(xy-1)}{xy}\right)=\frac{(1)(xy-1)}{(x)(x1)}=\frac{(xy-1)}{x^2}=\frac{xy-1}{x^2}$$

22) $\dfrac{1}{x^2-9}\div\dfrac{1}{(x-3)^2}$

$$\frac{1}{x^2-9}\div\frac{1}{(x-3)^2}=\left(\frac{1}{x^2-9}\right)\left(\frac{(x-3)^2}{1}\right)=\left(\frac{1}{(x+3)(x-3)}\right)\left(\frac{(x-3)(x-3)}{1}\right)=\frac{(x-3)(x-3)}{(x+3)(x-3)}=\frac{(x-3)(1)}{(x+3)(1)}$$

$$=\frac{(x-3)}{(x+3)}=\frac{x-3}{x+3}$$

24) $\dfrac{y-3}{y^2-6y+9}\div\dfrac{y-3}{4}$

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

$$=\frac{(1)(4)}{(1)(y-3)(y-3)}=\frac{4}{(y-3)(y-3)}=\frac{4}{(y-3)^2}$$

26) $\dfrac{7x+3y}{42x^2-17xy-15y^2}\bullet\dfrac{12x^2-4xy-5y^2}{2x+y}$

$$\frac{7x+3y}{42x^2-17xy-15y^2}\bullet\frac{12x^2-4xy-5y^2}{2x+y}=\left(\frac{(7x+3y)}{(7x+3y)(6x-5y)}\right)\left(\frac{(2x+y)(6x-5y)}{(2x+y)}\right)$$

$$=\frac{(7x+3y)(2x+y)(6x-5y)}{(7x+3y)(6x-5y)(2x+y)}=\frac{(1)(1)(1)}{(1)(1)(1)}=\frac{1}{1}=1$$

28) $\dfrac{a^2+7a+12}{a-5} \div \dfrac{a^2+9a+18}{a^2-7a+10}$

$$\frac{a^2+7a+12}{a-5} \div \frac{a^2+9a+18}{a^2-7a+10} = \left(\frac{a^2+7a+12}{a-5}\right)\left(\frac{a^2-7a+10}{a^2+9a+18}\right) = \left(\frac{(a+4)(a+3)}{(a-5)}\right)\left(\frac{(a-2)(a-5)}{(a+6)(a+3)}\right)$$

$$= \frac{(a+4)(a+3)(a-2)(a-5)}{(a-5)(a+6)(a+3)} = \frac{(a+4)(1)(a-2)(1)}{(a-5)(1)(1)}$$

$$= \frac{(a+4)(a-2)}{(a-5)} = \frac{(a+4)(a-2)}{a-5}$$

30) $\dfrac{9t^2-1}{6t^2+7t-3} \div \dfrac{27t^3+1}{8t^3+27}$

$$\frac{9t^2-1}{6t^2+7t-3} \div \frac{27t^3+1}{8t^3+27} = \left(\frac{9t^2-1}{6t^2+7t-3}\right)\left(\frac{8t^3+27}{27t^3+1}\right) = \left(\frac{(3t+1)(3t-1)}{(2t+3)(3t-1)}\right)\left(\frac{(2t+3)(4t^2-6t+9)}{(3t+1)(9t^2-3t+1)}\right)$$

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

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

32) $\dfrac{x^2-2x+1}{3x^2+7x-20} \div \dfrac{x^2+3x-4}{3x^2-2x-5}$

$$\frac{x^2-2x+1}{3x^2+7x-20} \div \frac{x^2+3x-4}{3x^2-2x-5} = \left(\frac{x^2-2x+1}{3x^2+7x-20}\right)\left(\frac{3x^2-2x-5}{x^2+3x-4}\right) = \left(\frac{(x-1)(x-1)}{(x+4)(3x-5)}\right)\left(\frac{(x+1)(3x-5)}{(x+4)(x-1)}\right)$$

$$= \frac{(x-1)(x-1)(x+1)(3x-5)}{(x+4)(3x-5)(x+4)(x-1)} = \frac{(x-1)(1)(x+1)(1)}{(x+4)(1)(x+4)(1)}$$

$$= \frac{(x-1)(x+1)}{(x+4)(x+4)} = \frac{(x-1)(x+1)}{(x+4)^2}$$

34) $\dfrac{3a^2+7ab-20b^2}{a^2+5ab+4b^2} \div \dfrac{3a^2-17ab+20b^2}{3a-12b}$

$$\frac{3a^2+7ab-20b^2}{a^2+5ab+4b^2} \div \frac{3a^2-17ab+20b^2}{3a-12b} = \left(\frac{3a^2+7ab-20b^2}{a^2+5ab+4b^2}\right)\left(\frac{3a-12b}{3a^2-17ab+20b^2}\right)$$

$$= \left(\frac{(a+4b)(3a-5b)}{(a+b)(a+4b)}\right)\left(\frac{(3)(a-4b)}{(3a-5b)(a-4b)}\right)$$

$$= \frac{(a+4b)(3a-5b)(3)(a-4b)}{(a+b)(a+4b)(3a-5b)(a-4b)}$$

$$= \frac{(1)(1)(3)(1)}{(a+b)(1)(1)(1)} = \frac{3}{(a+b)} = \frac{3}{a+b}$$

36) $\dfrac{m^2+4m-21}{m^2-12m+27}\bullet\dfrac{m^2-7m+12}{m^2+3m-28}$

$$\frac{m^2+4m-21}{m^2-12m+27}\bullet\frac{m^2-7m+12}{m^2+3m-28}=\left(\frac{(m+7)(m-3)}{(m-3)(m-9)}\right)\left(\frac{(m-3)(m-4)}{(m+7)(m-4)}\right)$$

$$=\frac{(m+7)(m-3)(m-3)(m-4)}{(m-3)(m-9)(m+7)(m-4)}$$

$$=\frac{(1)(1)(m-3)(1)}{(1)(m-9)(1)(1)}=\frac{(m-3)}{(m-9)}=\frac{m-3}{m-9}$$

38) $\dfrac{12a^2b-3ab^2-42b^3}{9a^2-36b^2}\bullet\dfrac{6a^2-15ab+6b^2}{8a^3b-b^4}$

$$\frac{12a^2b-3ab^2-42b^3}{9a^2-36b^2}\bullet\frac{6a^2-15ab+6b^2}{8a^3b-b^4}=\left(\frac{3b(4a^2-ab-14b^2)}{9(a^2-4b^2)}\right)\left(\frac{3(2a^2-5ab+2b^2)}{b(8a^3-b^3)}\right)$$

$$=\left(\frac{(3b)(4a+7b)(a-2b)}{(9)(a+2b)(a-2b)}\right)\left(\frac{(3)(2a-b)(a-2b)}{(b)(2a-b)(4a^2+2ab+b^2)}\right)$$

$$=\frac{(1)(4a+7b)(1)(3)(1)(a-2b)}{(3)(a+2b)(1)(1)(1)(4a^2+2ab+b^2)}$$

$$=\frac{(1)(4a+7b)(1)(1)(1)(a-2b)}{(1)(a+2b)(1)(1)(1)(4a^2+2ab+b^2)}$$

$$=\frac{(4a+7b)(a-2b)}{(a+2b)(4a^2+2ab+b^2)}$$

40) $\dfrac{490x^2-640}{49x^2-112x+64}\bullet\dfrac{28x^2-95x+72}{56x^3-62x^2-144x}$

$$\frac{490x^2-640}{49x^2-112x+64}\bullet\frac{28x^2-95x+72}{56x^3-62x^2-144x}=\left(\frac{10(49x^2-64)}{(7x-8)(7x-8)}\right)\left(\frac{(4x-9)(7x-8)}{2x(28x^2-31x-72)}\right)$$

$$=\left(\frac{(10)(7x+8)(7x-8))}{(7x-8)(7x-8)}\right)\left(\frac{(4x-9)(7x-8)}{(2x)(7x+8)(4x-9))}\right)$$

$$=\frac{(10)(7x+8)(7x-8))(4x-9)(7x-8)}{(7x-8)(7x-8)(2x)(7x+8)(4x-9))}$$

$$=\frac{(5)(1)(1))(1)(1)}{(1)(1)(1x)(1)(1))}$$

$$=\frac{5}{x}$$

42) $\dfrac{2x^4-16x}{3x^6-48x^2}\bullet\dfrac{6x^5+24x^3}{4x^4+8x^3+16x^2}$

$$\frac{2x^4-16x}{3x^6-48x^2}\bullet\frac{6x^5+24x^3}{4x^4+8x^3+16x^2}=\left(\frac{2x(x^3-8)}{3x^2(x^4-16)}\right)\left(\frac{6x^3(x^2+4)}{4x^2(x^2+x+4)}\right)$$

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

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

$$=\frac{(2x)(x-2)(x^2+2x+4)(6x^3)(x^2+4)}{(3x^2)(x^2+4)(x+2)(x-2)(4x^2)(x^2+x+1)}$$

$$=\frac{(1)(1)(1)(2x)(1)}{(1)(1)(x+2)(1)(2x)(1)}=\frac{(1)(1)(1)(1)(1)}{(1)(1)(x+2)(1)(1)(1)}=\frac{1}{(x-2)}=\frac{1}{x-2}$$

44) $\dfrac{a^2-6ab+9b^2}{a^2-4b^2}\bullet\dfrac{a^2-5ab+6b^2}{(a-3b)^2}\div\dfrac{a^2-9b^2}{a^2-ab-6b^2}$

$$\frac{a^2-6ab+9b^2}{a^2-4b^2}\bullet\frac{a^2-5ab+6b^2}{(a-3b)^2}\div\frac{a^2-9b^2}{a^2-ab-6b^2}=\left(\frac{a^2-6ab+9b^2}{a^2-4b^2}\right)\left(\frac{a^2-5ab+6b^2}{(a-3b)^2}\right)\left(\frac{a^2-ab-6b^2}{a^2-9b^2}\right)$$

$$=\left(\frac{(a-3b)(a-3b)}{(a+2b)(a-2b)}\right)\left(\frac{(a-2b)(a-3b)}{(a-3b)(a-3b)}\right)\left(\frac{(a+2b)(a-3b)}{(a+3b)(a-3b)}\right)$$

$$=\frac{(a-3b)(a-3b)(a-2b)(a-3b)(a+2b)(a-3b)}{(a+2b)(a-2b)(a-3b)(a-3b)(a+3b)(a-3b)}$$

$$=\frac{(1)(1)(1)(a-3b)(1)(1)}{(1)(1)(1)(1)(a+3b)(1)}=\frac{(a-3b)}{(a+3b)}=\frac{a-3b}{a+3b}$$

46) $\dfrac{8y^2+18y-5}{21y^2-16y+3}\bullet\dfrac{35y^2-22y+3}{6y^2+17y+5}\div\dfrac{16y^2-1}{9y^2-1}$

$$\frac{8y^2+18y-5}{21y^2-16y+3}\bullet\frac{35y^2-22y+3}{6y^2+17y+5}\div\frac{16y^2-1}{9y^2-1}=\left(\frac{8y^2+18y-5}{21y^2-16y+3}\right)\left(\frac{35y^2-22y+3}{6y^2+17y+5}\right)\left(\frac{9y^2-1}{16y^2-1}\right)$$

$$=\left(\frac{(2y+5)(4y-1)}{(7y-3)(3y-1)}\right)\left(\frac{(7y-3)(5y-1)}{(2y+5)(3y+1)}\right)\left(\frac{(3y+1)(3y-1)}{(4y+1)(4y-1)}\right)$$

$$=\frac{(2y+5)(4y-1)(7y-3)(5y-1)(3y+1)(3y-1)}{(7y-3)(3y-1)(2y+5)(3y+1)(4y+1)(4y-1)}$$

$$=\frac{(1)(1)(1)(5y-1)(1)(1)}{(1)(1)(1)(1)(4y+1)(1)}=\frac{(5y-1)}{(4y+1)}=\frac{5y-1}{4y+1}$$

48) $\dfrac{ax+bx+2a+2b}{ax-3a+bx-3b}\bullet\dfrac{ax-bx-3a+3b}{ax-bx-2a+2b}$

$$\frac{ax+bx+2a+2b}{ax-3a+bx-3b}\bullet\frac{ax-bx-3a+3b}{ax-bx-2a+2b}=\left(\frac{x(a+b)+2(a+b)}{a(x-3)+b(x-3)}\right)\left(\frac{x(a-b)-3(a-b)}{x(a-b)-2(a-b)}\right)$$

$$=\left(\frac{(a+b)(x+2)}{(x-3)(a+b)}\right)\left(\frac{(a-b)(x-3)}{(a-b)(x-2)}\right)=\frac{(a+b)(x+2)(a-b)(x-3)}{(x-3)(a+4)(a-b)(x-2)}$$

$$=\frac{(1)(x+2)(1)(1)}{(1)(1)(1)(x-2)}=\frac{(x+2)}{(x-2)}=\frac{x+2}{x-2}$$

50) $\dfrac{4xb-8b+12x-24}{xb^2+3b^2+3xb+9b}\div\dfrac{4xb-8b-8x+16}{xb^2+3b^2-2xb-6b}$

$$\frac{4xb-8b+12x-24}{xb^2+3b^2+3xb+9b}\div\frac{4xb-8b-8x+16}{xb^2+3b^2-2xb-6b}=\left(\frac{4xb-8b+12x-24}{xb^2+3b^2+3xb+9b}\right)\left(\frac{xb^2+3b^2-2xb-6b}{4xb-8b-8x+16}\right)$$

$$=\left(\frac{4\{xb-2b+3x-6\}}{b\{xb+3b+3x+9\}}\right)\left(\frac{b\{xb+3b-2x-6\}}{4\{xb-2b-2x+4\}}\right)$$

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

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

$$=\frac{(4)(x-2)(b+3)(b)(x+3)(b-2)}{(b)(x+3)(b+3)(4)(x-2)(b-2)}$$

$$=\frac{(1)(1)(1)(1)(1)(1)}{(1)(1)(1)(1)(1)(1)}=\frac{1}{1}=1$$

52) $\dfrac{x^3+2x^2-9x-18}{x^4+3x^3-4x^2-12x}\bullet\dfrac{x^3+5x^2+6x}{x^2-x-6}$

$$\frac{x^3+2x^2-9x-18}{x^4+3x^3-4x^2-12x}\bullet\frac{x^3+5x^2+6x}{x^2-x-6}=\left(\frac{x^2(x+2)-9(x+2)}{x\{x^3+3x^2-4x-12\}}\right)\left(\frac{x\{x^2+5x+6\}}{(x+2)(x-3)}\right)$$

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

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

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

$$=\frac{(x+2)(x+3)(x-3)(x)(x+2)(x+3)}{(x)(x+3)(x+2)(x-2)(x+2)(x-3)}$$

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

54) $\dfrac{a^3-a^2b}{ac-a}\div\left(\dfrac{a-b}{c-1}\right)^2$

$$\frac{a^3-a^2b}{ac-a}\div\left(\frac{a-b}{c-1}\right)^2=\frac{a^3-a^2b}{ac-a}\div\frac{(a-b)^2}{(c-1)^2}=\left(\frac{a^3-a^2b}{ac-a}\right)\left(\frac{(c-1)^2}{(a-b)^2}\right)=\left(\frac{(a^2)(a-b)}{(a)(c-1)}\right)\left(\frac{(c-1)(c-1)}{(a-b)(a-b)}\right)$$

$$=\frac{(a^2)(a-b)(c-1)(c-1)}{(a)(c-1)(a-b)(a-b)}=\frac{(a)(1)(1)(c-1)}{(1)(1)(1)(a-b)}=\frac{(a)(c-1)}{(a-b)}=\frac{a(c-1)}{a-b}$$

56) $\dfrac{ax-2a+2xy-4y}{ax+2a-2xy-4y}\div\dfrac{ax+2a+2xy+4y}{ax-2a-2xy+4y}$

$$\frac{ax-2a+2xy-4y}{ax+2a-2xy-4y}\div\frac{ax+2a+2xy+4y}{ax-2a-2xy+4y}=\left(\frac{ax-2a+2xy-4y}{ax+2a-2xy-4y}\right)\left(\frac{ax-2a-2xy+4y}{ax+2a+2xy+4y}\right)$$

$$=\left(\frac{a(x-2)+2y(x-2)}{a(x+2)-2y(x+2)}\right)\left(\frac{a(x-2)-2y(x-2)}{a(x+2)+2y(x+2)}\right)$$

$$=\left(\frac{(x-2)(a+2y)}{(x+2)(a-2y)}\right)\left(\frac{(x-2)(a-2y)}{(x+2)(a+2y)}\right)$$

$$=\frac{(x-2)(a+2y)(x-2)(a-2y)}{(x+2)(a-2y)(x+2)(a+2y)}$$

$$=\frac{(x-2)(1)(x-2)(1)}{(x+2)(1)(x+2)(1)}=\frac{(x-2)(x-2)}{(x+2)(x+2)}=\frac{(x-2)^2}{(x+2)^2}$$

58) $\dfrac{k^2-1}{k^3+1}\div\dfrac{k^3-1}{k-1}\bullet(k^2+k+1)$

$$\frac{k^2-1}{k^3+1}\div\frac{k^3-1}{k-1}\bullet(k^2+k+1)=\left(\frac{k^2-1}{k^3+1}\right)\left(\frac{k-1}{k^3-1}\right)\left(\frac{(k^2+k+1)}{1}\right)$$

$$=\left(\frac{(k+1)(k-1)}{(k+1)(k^2-k+1)}\right)\left(\frac{(k-1)}{(k-1)(k^2+k+1)}\right)\left(\frac{(k^2+k+1)}{1}\right)$$

$$=\frac{(k+1)(k-1)(k-1)(k^2+k+1)}{(k+1)(k^2-k+1)(k-1)(k^2+k+1)}=\frac{(1)(k-1)(1)(1)}{(1)(k^2-k+1)(1)(1)}=\frac{(k-1)}{(k^2-k+1)}=\frac{k-1}{k^2-k+1}$$

60) $\dfrac{r^3-s^3}{s-r}\bullet\dfrac{(r+s)^2}{r^2+s^2}$

$$\frac{r^3-s^3}{s-r}\bullet\frac{(r+s)^2}{r^2+s^2}=\left(\frac{(r-s)(r^2+rs+s^2)}{(s-r)}\right)\left(\frac{(r+s)(r+s)}{(r^2+s^2)}\right)=\frac{(r-s)(r^2+rs+s^2)(r+s)(r+s)}{(s-r)(r^2+s^2)}$$

$$=\frac{\{-s+r\}(r^2+rs+s^2)(r+s)(r+s)}{(s-r)(r^2+s^2)}=\frac{\{-1(s-r)\}(r^2+rs+s^2)(r+s)(r+s)}{(s-r)(r^2+s^2)}$$

$$=\frac{\{-1(1)\}(r^2+rs+s^2)(r+s)(r+s)}{(1)(r^2+s^2)}=\frac{-(r^2+rs+s^2)(r+s)^2}{r^2+s^2}$$

62) $(4x+8)\bullet\dfrac{x}{x+2}$

$$(4x+8)\bullet\frac{x}{x+2}=\left(\frac{(4x+8)}{1}\right)\left(\frac{x}{x+2}\right)=\left(\frac{(4)(x+2)}{1}\right)\left(\frac{(x)}{(x+2)}\right)=\frac{(4)(1)(x)}{(1)}=\frac{4x}{1}=4x$$

64) $(x^2-49)\bullet\dfrac{5}{x+7}$

$$(x^2-49)\bullet\frac{5}{x+7}=\left(\frac{(x^2-49)}{1}\right)\left(\frac{5}{x+7}\right)=\left(\frac{(x+7)(x-7)}{1}\right)\left(\frac{(5)}{(x+7)}\right)=\frac{(x+7)(x-7)(5)}{(x+7)}=\frac{(1)(x-7)(5)}{(1)}$$

$$=\frac{5(x-7)}{1}=5(x-7)=5x-35$$

66) $(x^2-3x+2)\bullet\dfrac{-1}{x-2}$

$$(x^2-3x+2)\bullet\frac{-1}{x-2}=\left(\frac{(x^2-3x+2)}{1}\right)\left(\frac{-1}{x-2}\right)=\left(\frac{(x-1)(x-2)}{1}\right)\left(\frac{(-1)}{(x-2)}\right)=\frac{(x-1)(x-2)(-1)}{(x-2)}$$

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

68) $(y+1)(y+4)(y-1)\bullet\dfrac{3}{y^2-1}$

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

$$=\frac{(y+1)(y+4)(y-1)(3)}{(y+1)(y-1)}=\frac{(1)(y+4)(1)(3)}{(1)(1)}=\frac{3(y+4)}{1}=3(y+1)$$

70) $a(a+3)(a-3)\bullet\dfrac{a-1}{a^2-3a}$

$$a(a+3)(a-3)\bullet\frac{a-1}{a^2-3a}=\left(\frac{a(a+3)(a-3)}{1}\right)\left(\frac{a-1}{a^2-3a}\right)=\left(\frac{(a)(a+3)(a-3)}{1}\right)\left(\frac{(a-1)}{(a)(a-3)}\right)$$

$$=\frac{(a)(a+3)(a-3)(a-1)}{(a)(a-3)}=\frac{(1)(a+3)(1)(a-1)}{(1)(1)}=\frac{(a+3)(a-1)}{1}=(a+3)(a-1)$$