

1. Zkrat' lomené výrazy:

$$a) \frac{72abx}{84aby} = \frac{8 \cdot 9x}{4 \cdot 21y} = \frac{2 \cdot 3x}{7y} = \frac{6x}{7y}$$

$$b) \frac{p^2 - 2pq + q^2}{p^2 - q^2} = \frac{(p-q)^2}{p^2 - q^2} = \frac{(p-q)(p-q)}{(p-q)(p+q)} = \frac{p-q}{p+q}$$

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

$$d) \frac{16 - 8a + a^2}{ab - 4b} = \frac{4^2 - 8a + a^2}{b(a-4)} = \frac{(4-a)^2}{b(a-4)} = \frac{(4-a)^2}{-b(4-a)} = \frac{4-a}{-b} = \frac{a-4}{b}$$

$$e) \frac{a^2 + 2ab + b^2 - c^2}{a^2 + 2ac + c^2 - b^2} = \frac{(a+b)^2 - c^2}{(a+c)^2 - b^2} = \frac{[(a+b)-c][(a+b)+c]}{[(a+c)-b][(a+c)+b]} = \frac{a+b-c}{a+c-b}$$

$$f) \frac{ab + 2b - ac - 2c}{ab - 2b - ac + 2c} = \frac{a(b-c) + 2(b-c)}{a(b-c) - 2(b-c)} = \frac{(b-c)(a+2)}{(b-c)(a-2)} = \frac{a+2}{a-2}$$

$$g) \frac{x^2 - 4x + 4}{x^2 - 5x + 6} = \frac{(x-2)^2}{(x-2)(x-3)} = \frac{x-2}{x-3}$$

$$h) \frac{3uv + 9v - 2u - 6}{3uv - 2u - 9v + 6} = \frac{3v(u+3) - 2(u+3)}{u(3v-2) - 3(3v-2)} = \frac{(u+3)(3v-2)}{(3v-2)(u-3)} = \frac{u+3}{u-3}$$

$$i) \frac{a^2 + 2a - 15}{3a + 15} = \frac{(a+5)(a-3)}{3(a+5)} = \frac{a-3}{3}$$

$$j) \frac{a^2 - a - 20}{a^2 + a - 30} = \frac{(a-5)(a+4)}{(a+6)(a-5)} = \frac{a+4}{a+6}$$

$$k) \frac{3x^2 + x - 10}{4x^2 + x - 14} = \frac{3x^2 + 6x - 5x - 10}{4x^2 + 8x - 7x - 14} = \frac{3x(x+2) - 5(x+2)}{4x(x+2) - 7(x+2)} = \frac{(x+2)(3x-5)}{(x+2)(4x-7)} = \frac{3x-5}{4x-7}$$

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

2. Rozšiř dané lomené výrazy na tvary se jmenovatelem ve složené závorce:

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

$$\frac{x}{y-2} \cdot \frac{-1}{-1} = \frac{-x}{2-y}$$

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

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

$$c) \frac{y-1}{x+1} \{(x^3+1)\}$$

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

$$d) \frac{a+1}{(a+1)^2} \{(a^2-1)\}$$

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

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

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

3. Dokaž, že platí:

$$a) \frac{ac+bx+ax+bc}{ay+2bx+2ax+by} = \frac{ac+ax+bx+bc}{ay+by+2bx+2ax} = \frac{a(c+x)+b(x+c)}{y(a+b)+2x(b+a)} = \frac{(x+c)(a+b)}{(a+b)(y+2x)} = \frac{x+c}{2x+y}$$

$$\frac{x-xy+z-zy}{1-3y+3y^2-y^3} = \frac{x(1-y)+z(1-y)}{1-y^3-3y+3y^2} = \frac{(1-y)(x+z)}{(1-y)(1+y+y^2)-3y(1-y)} = \frac{(1-y)(x+z)}{(1-y)[(1+y+y^2)-3y]} =$$

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

$$\frac{3a^3+ab^2-6a^2b-2b^3}{9a^5-ab^4-18a^4b+2b^5} = \frac{3a^3-6a^2b+ab^2-2b^3}{9a^5-18a^4b-ab^4+2b^5} = \frac{3a^2(a-2b)+b^2(a-2b)}{9a^4(a-2b)-b^4(a-2b)} = \frac{(a-2b)(3a^2+b^2)}{(a-2b)(9a^4-b^4)} =$$

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

4. Uprav a uveď podmínky, za kterých mají výrazy smysl:

$$a) \frac{2m-n}{m-n} + \frac{m}{n-m} = \frac{2m-n}{m-n} + \frac{m}{-(m-n)} = \frac{2m-n-m}{m-n} = \frac{m-n}{m-n} = 1$$

$$m \neq n$$

$$b) \frac{x-y}{xy} - \frac{z-y}{zy} + \frac{x+z}{xz} = \frac{xz-yz}{xyz} - \frac{xz-xy}{xyz} + \frac{xy+yz}{xyz} = \frac{xz-yz-xz+xy+xy+yz}{xyz} = \frac{2xy}{xyz} = \frac{2}{z}$$

$$x \neq 0; y \neq 0; z \neq 0$$

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

$$u \neq -1$$

$$d) \frac{4mn}{m-n} + (m-n) = \frac{4mn}{m-n} + \frac{(m-n)(m-n)}{(m-n)} = \frac{4mn+m^2-2mn+n^2}{m-n} = \frac{m^2+2mn+n^2}{m-n} = \frac{(m+n)^2}{m-n}$$

$$m \neq n$$

$$e) 1 - \frac{2p}{q} + \frac{p^2}{q^2} - \frac{(q-p)^2}{q^2} = \frac{q^2}{q^2} - \frac{2pq}{q^2} + \frac{p^2}{q^2} - \frac{q^2-2qp+p^2}{q^2} = \frac{q^2-2pq+p^2-(q^2-2qp+p^2)}{q^2} = 0$$

$$q \neq 0$$

$$\frac{7v-1}{2v^2+6v} + \frac{5-3v}{v^2-9} = \frac{7v-1}{2v(v+3)} + \frac{5-3v}{(v-3)(v+3)} = \frac{(7v-1)(v-3)}{2v(v+3)(v-3)} + \frac{2v(5-3v)}{2v(v-3)(v+3)} =$$

$$f) = \frac{7v^2-21v-v+3+10v-6v^2}{2v(v-3)(v+3)} = \frac{v^2-12v+3}{2v(v-3)(v+3)}$$

$$v \neq 0; v \neq \pm 3$$

$$g) \frac{2p+q}{p^2+pq} + \frac{1}{p} - \frac{1}{p+q} = \frac{2p+q}{p(p+q)} + \frac{p+q}{p(p+q)} - \frac{p}{p(p+q)} = \frac{2p+q+p+q-p}{p(p+q)} = \frac{2(p+q)}{p(p+q)} = \frac{2}{p}$$

$$p \neq 0; p \neq -q$$

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

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

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

$$a \neq \pm b$$

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

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

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

$$x \neq \pm 1$$

$$\frac{4}{3m-3n} - \frac{3m-4n}{2m^2-4mn+2n^2} = \frac{4}{3(m-n)} - \frac{3m-4n}{2(m^2-2mn+n^2)} = \frac{4 \cdot 2(m-n)}{2 \cdot 3(m-n)^2} - \frac{3(3m-4n)}{3 \cdot 2(m-n)^2} =$$

$$j) \frac{8m-8n-(9m-12n)}{2 \cdot 3(m-n)^2} = \frac{4n-m}{6(m-n)^2}$$

$$m \neq n$$

5. Zjednoduř vřaz $a+1+\frac{a-1}{a^2-a+1}$ a dokař, ře m smysl pro kařd a .

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

Zlomok m smysl vřdy, kdyř je jeho jmenovatel rzn od nuly. Mnohořlen ve jmenovateli se vřak nule nikdy nerovn.

6. Dokař, ře pro vřechna nenulov ısla t je souřet vřaz $1+t$ a $1+\frac{1}{t}$ roven jejich souřinu.

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

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

7. Uprav a uved' podmnky, za kterch mj vřazy smysl:

$$a) \frac{3x^3b^3}{25y^4} \cdot \left(-\frac{15y}{b^2}\right) = -\frac{3x^3b^3}{25y^4} \cdot \frac{15y}{b^2} = -\frac{9x^3b}{5y^3}$$

$$y \neq 0; b \neq 0$$

$$b) \frac{9x}{a^3} \cdot \left(-\frac{y}{32b^2}\right) \left(-\frac{4a}{27xy}\right) \cdot 24a^2b^3 = \frac{3^2x}{a^3} \cdot \frac{y}{2^5b^2} \cdot \frac{2^2a}{3^3xy} \cdot 2^3 \cdot 3a^2b^3 = b$$

$$x \neq 0; y \neq 0; a \neq 0; b \neq 0$$

$$c) \frac{2v^2+8v+8}{v-2} \cdot \frac{(v-2)^2}{4(v+2)} = \frac{2(v^2+4v+4)}{1} \cdot \frac{(v-2)}{4(v+2)} = (v+2)^2 \cdot \frac{(v-2)}{2(v+2)} = (v+2) \cdot \frac{(v-2)}{2} = \frac{v^2-4}{2}$$

$$v \neq \pm 2$$

$$d) \left(\frac{1}{a} - \frac{1}{b} \right) \cdot \frac{a^2}{a-b} = \left(\frac{b}{ab} - \frac{a}{ab} \right) \cdot \frac{a^2}{a-b} = \frac{b-a}{ab} \cdot \frac{a^2}{a-b} = -\frac{a-b}{b} \cdot \frac{a}{a-b} = -\frac{a}{b}$$

$$a \neq 0; b \neq 0; a \neq b$$

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

$$s \neq -1; s \neq 2$$

$$f) \left(y+1 + \frac{1}{2y-1} \right) \left(y-1 + \frac{1}{2y+1} \right) = \left[\frac{(y+1)(2y-1)}{2y-1} + \frac{1}{2y-1} \right] \left[\frac{(y-1)(2y+1)}{2y+1} + \frac{1}{2y+1} \right] =$$

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

$$y \neq \pm \frac{1}{2}$$

$$g) \left(\frac{x^2}{x-y} - x \right) \left(\frac{x^2}{y^2} - \frac{y}{x} \right) = \left(\frac{x^2}{x-y} - \frac{x(x-y)}{x-y} \right) \left(\frac{x^2}{y^2} \cdot \frac{x}{x} - \frac{y}{x} \cdot \frac{y^2}{y^2} \right) = \left(\frac{x^2 - x^2 + xy}{x-y} \right) \left(\frac{x^3 - y^3}{xy^2} \right) =$$

$$= \frac{xy}{x-y} \cdot \frac{(x-y)(x^2 + xy + y^2)}{xy^2} = \frac{x^2 + xy + y^2}{y}$$

$$x \neq 0; y \neq 0; x \neq y$$

$$h) \left[\frac{3}{(x-3)^3} + \frac{1}{x-3} - \frac{3}{x^2-9} \right] \cdot \frac{x^2-6x+9}{x^2+9} = \left[\frac{3}{(x-3)^3} + \frac{1}{x-3} - \frac{3}{(x-3)(x+3)} \right] \cdot \frac{(x-3)^2}{x^2+9} =$$

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

$$= \left[\frac{3x+9 + (x^2-6x+9)(x+3) - 3(x^2-6x+9)}{(x-3)^3(x+3)} \right] \cdot \frac{(x-3)^2}{x^2+9} =$$

$$= \left[\frac{3x+9 + x^3 - 6x^2 + 9x + 3x^2 - 18x + 27 - 3x^2 + 18x - 27}{(x-3)^3(x+3)} \right] \cdot \frac{(x-3)^2}{x^2+9} =$$

$$= \frac{x^3 - 6x^2 + 12x + 9}{(x-3)^3(x+3)} \cdot \frac{(x-3)^2}{x^2+9} = \frac{x^3 - 6x^2 + 12x + 9}{(x-3)(x+3)} \cdot \frac{1}{x^2+9} = \frac{x^3 - 6x^2 + 12x + 9}{(x^2-9)(x^2+9)} = \frac{x^3 - 6x^2 + 12x + 9}{x^4 - 81}$$

$$x \neq \pm 3$$

8. Uprav a uveď podmínky, za kterých mají výrazy smysl:

$$a) \left(\frac{18a^2}{b^3} \cdot \frac{c}{2a^3} \right) : \left(-\frac{3a}{b^2c} \right) = -\frac{18a^2}{b^3} \cdot \frac{c}{2a^3} \cdot \frac{b^2c}{3a} = -\frac{3c^2}{a^2b}$$

$$a \neq 0; b \neq 0; c \neq 0$$

$$b) \frac{a^2 + ax}{x - x^2} : \frac{x^2 + ax}{a - ax} = \frac{a(a+x)}{x(1-x)} \cdot \frac{a(1-x)}{x(x+a)} = \left(\frac{a}{x} \right)^2$$

$$x \neq 0; a \neq 0; x \neq 1; x \neq -a$$

$$c) \left(\frac{2x^2 - 4x + 2}{x^2 + 1} : \frac{6x - 6}{x^4 - 1} \right) : \frac{x+1}{3} = \frac{2(x^2 - 2x + 1)}{x^2 + 1} \cdot \frac{(x^2)^2 - 1}{6(x-1)} \cdot \frac{3}{x+1} = \frac{(x-1)^2}{x^2 + 1} \cdot \frac{(x^2 + 1)(x^2 - 1)}{(x-1)(x+1)} =$$

$$= (x-1)^2$$

$$x \neq \pm 1$$

$$\frac{r^4 - s^4}{r^2 s^2} : \left[\left(1 + \frac{s^2}{r^2} \right) \left(1 - \frac{2r}{s} + \frac{r^2}{s^2} \right) \right] = \frac{(r^2 - s^2)(r^2 + s^2)}{r^2 s^2} : \left[\left(\frac{r^2 + s^2}{r^2} \right) \left(\frac{s^2 - 2rs + r^2}{s^2} \right) \right] =$$

$$= \frac{(r^2 - s^2)(r^2 + s^2)}{r^2 s^2} : \left(\frac{r^2 + s^2}{r^2} \cdot \frac{(s-r)^2}{s^2} \right) = \frac{(r^2 - s^2)(r^2 + s^2)}{r^2 s^2} \cdot \frac{r^2 s^2}{(r^2 + s^2)(s-r)^2} =$$

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

$$r \neq 0; s \neq 0; r \neq s$$

$$e) \left(1 + \frac{a^3}{b^3} \right) : \left(1 + \frac{a}{b} \right) = \left(\frac{b^3 + a^3}{b^3} \right) : \left(\frac{b+a}{b} \right) = \frac{(b+a)(b^2 - ba + a^2)}{b^3} \cdot \frac{b}{b+a} = \frac{b^2 - ba + a^2}{b^2}$$

$$b \neq 0; b \neq -a$$

$$(c^3 - d^3) : \left(c + \frac{d^2}{c+d} \right) = (c-d)(c^2 + cd + d^2) : \left(c \frac{c+d}{c+d} + \frac{d^2}{c+d} \right) = (c-d)(c^2 + cd + d^2) : \left(\frac{c^2 + cd + d^2}{c+d} \right) =$$

$$f) = (c-d)(c^2 + cd + d^2) \cdot \frac{c+d}{c^2 + cd + d^2} = (c-d)(c+d) = c^2 - d^2$$

$$c \neq -d$$

9. Uprav a uveď podmínky, za kterých mají výrazy smysl:

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

$$m \neq 0; m \neq -2$$

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

$$a \neq 0; a \neq b$$

$$c) \frac{\frac{x}{4} - \frac{x-1}{5}}{\frac{x+1}{6} - \frac{x-1}{10}} = \frac{\frac{5x - 4(x-1)}{4 \cdot 5}}{\frac{5(x+1) - 3(x-1)}{30}} = \frac{\frac{x+4}{20}}{\frac{2x+8}{30}} = \frac{30(x+4)}{20(2x+8)} = \frac{3(x+4)}{2 \cdot 2(x+4)} = \frac{3}{4}$$

$$x \neq -4$$

$$d) \frac{\frac{r+s}{1 - \frac{r^2 + s^2}{r^2 - s^2}} - \frac{r-s}{r+s}}{\frac{r^2 + s^2}{r^2 - s^2}} = \frac{\frac{(r+s)^2 - (r-s)^2}{(r-s)(r+s)}}{\frac{r^2 - s^2 - (r^2 + s^2)}{r^2 - s^2}} = \frac{\frac{r^2 + 2rs + s^2 - (r^2 - 2rs + s^2)}{r^2 - s^2}}{\frac{-2s^2}{r^2 - s^2}} = \frac{\frac{4rs}{r^2 - s^2}}{\frac{-2s^2}{r^2 - s^2}} = \frac{4rs(r^2 - s^2)}{-2s^2(r^2 - s^2)} = -\frac{2r}{s}$$

$$s \neq 0; r \neq \pm s$$

$$e) \frac{2 - \frac{k^2 + z^2}{kz}}{\frac{k}{z^2} - \frac{2}{z} + \frac{1}{k}} = \frac{\frac{2kz - (k^2 + z^2)}{kz}}{\frac{k^2}{z^2 k} - \frac{2zk}{z^2 k} + \frac{z^2}{z^2 k}} = \frac{\frac{-(k^2 - 2kz + z^2)}{kz}}{\frac{k^2 - 2kz + z^2}{z^2 k}} = \frac{\frac{-(k-z)^2}{kz}}{\frac{(k-z)^2}{z^2 k}} = -\frac{z^2 k (k-z)^2}{kz (k-z)^2} = -z$$

$$k \neq 0; z \neq 0; k \neq z$$

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

$$a \neq 0; b \neq 0; a \neq b$$

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

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

$$= \frac{a^4 - a^3 b + a^2 b^2 + a^3 b - a^2 b^2 + ab^3 + a^2 b^2 - ab^3 + b^4}{ab} = \frac{a^4 + a^2 b^2 + b^4}{ab}$$

$$a \neq 0; b \neq 0; a \neq b$$

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

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

$$a \neq 0; b \neq 0; a \neq b$$

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

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

$$x \neq 0; y \neq 0; x \neq \pm y$$