# Výrazy, mnohočleny

1. Vypočítejte a kontrolu proveďte dosazením za proměnnou ***x*** = 1; ***y***= 2; {8x - [ -(2y + 4y) + 6x]} + 4x = [6(x+y); 18 ]

2. Vypočítejte:

a) 6 a4 - {2a3 + a2 -[4a2 + 3a3 – (2a2 + 3a) + 4]} [ 6a4 + a3 + a2- 3a + 4]

b) 9r - {- [-(2s + 4r) + 2s] - 3r} [8r]

c) 3u – (5u + 1).2 –2u [-9u-2]

d) (3w – 5w) . ( 1.2 –2w) [-4w+4w2]

e) (3x-5) [(3x-5)3x-5] [27x3-90x2+60x+25]

f) (3x-5)[3x-5(3x-5)] [-36x2+135x-125]

g) 3x-5[3x-5(3x-5)] [63x -125]

h) 3x-5[(3x-5)3x-5] [-45x2+78x+25]

3. Vypočtěte, pomocí vzorců umocněte:

* 1. (x-2)2 [x2-4x+4]
	2. (2x-3)2 [4x2-12x+9]
	3. (3x+2)2 [9x2+12x+4]
	4. (5x+2z)2 [25x2+20xz+4z2]
	5. (a+2)(a-2) + (a+2)2 - (a-2)2 [a2+8a-4]
	6. (3x+y)(3x-y)- (3x+y)2 + (3x-y)2 [9x2-12xy – y2]

4. Umocněte podle vhodného vzorce :

1. $\left(c+d\right)^{2}$ [$c^{2}+2cd+d^{2}$]
2. $\left(x-10\right)^{2}$ [$x^{2}-20x+100$]
3. $\left(3y-0,4\right)^{2}$ [9$y^{2}-2,4y+0,16$ ]
4. $\left(\frac{m}{2}-1\right)^{2}$ [$\frac{m^{2}}{4}-m+1$]
5. $\left(k+m\right)^{3}$ [ $k^{3}+3k^{2}m+3km^{2}+m^{3}$]
6. $\left(p-2\right)^{3}$ [$p^{3}-6p^{2}+12p-8$ ]
7. $\left(r+4\right)^{3}$ [ $r^{3}+12r^{2}+48r+64$]
8. $\left(7-s\right)^{3}$ [343 -147s + 21$s^{2}-s^{3}$]

5. Rozložte na součin:

* 1. 15x2 y3 – 5xy [ 5xy(3xy2 -1) ]
	2. 75a5 b3 + 25a4 b3 – 5a2 b2 [ 5a2 b2(15a3 b + 5a2 b – 1)]

6. Dělte a uveďte podmínky pro dělitele :

a) $\left(10+6a^{3}-13a^{2}-9a\right):\left(2a-5\right)$ [3$a^{2}+a-2$, a≠$\frac{5}{2}$ ]

b) $\left(3x^{3}+x-5+14x^{2}\right)$: $\left(3x-1\right)$ [ $x^{2}+5x+2+\frac{-3}{3x-1}, x\ne \frac{1}{3} $]

c) $\left(4m^{3}-3m^{2}+2m-1\right): \left(m-3\right)$ [4$m^{2}+9m+29+\frac{86}{m-3}$ , m≠3 ]

d) $\left(10k^{2}-k^{3}-4k+2\right):\left(k-10\right)$ [-$k^{2}-4-\frac{38}{k-10},$ k≠10]

7. Rozložte na součin vytknutím výrazu v závorce:

 a) $\left(x-2\right)∙y+\left(x-2\right)∙4$ [$\left(x-2\right)\left(y+4\right)$]

b) 3$\left(y+4\right)-k\left(y+4\right)$ [$\left(y+4\right)\left(3-k\right)$]

c) $\left(3x-5\right)∙m-7\left(3x-5\right)$ [$\left(3x-5\right)\left(m-7\right)$]

 d) r$\left(s-3\right)+\left(s-3\right)∙\left(-4\right)$ ) [$\left(s-3\right)\left(r-4\right)$ ]

8. Rozložte na součin :

 a) 6r – 6s + kr – ks [$\left(r-s\right)\left(6+k\right)$]

b) kp + 3k -4p -12 [$\left(p+3\right)\left(k-4\right)$]

c) 5px + 10p + 2r + rx [$\left(x+2\right)\left(5p+r\right)$ ]

d) 14y – 7 – r + 2ry [$\left(2y-1\right)\left(7+r\right)$]

9. Výraz zjednodušte

a) $\frac{a^{2}-36}{a^{2}+36-12a}$ [$\frac{a+6}{a-6}$, a≠6 ],

b) $\frac{3x+12-px-4p}{x^{2}-16}$ [$\frac{3-p}{x-4}$, x≠±4 ],

c) $\frac{2m^{2}-20m+50}{4m-20+6ym-30y}$ [$\frac{m-5}{2+3y}$, y≠-$\frac{2}{3}$, m≠5],

d)$\frac{k^{4}-r^{4}}{r^{3}-rk^{2}}$ [-$\frac{k^{2}+r^{2}}{r}$, r≠0,r≠±k],

e) $\frac{\left(x-5\right)^{2}-1}{5x-30}:\frac{x^{3}-16x}{20x^{2}}$ [$\frac{4x}{x+4}$, x≠0, x≠±4, x≠6],

f) $\frac{3b^{2}-18b+27}{3y-12}:\frac{9-b^{2}}{3y-12+by-4b}$ [3-b,b≠±3, y≠4],

g) $\frac{5c^{3}-40}{14c-7c^{2}}:\left(4c^{2}+16+8c\right)$ [-$\frac{5}{28c}$, c≠2, c≠0]

návod : Výrazy v čitatelích a jmenovatelích zlomků rozložte na součiny, potom kraťte.

10. Výraz zjednodušte:

a) $\frac{12}{a^{2}-4}-\frac{3}{a-2}+\frac{4}{2+a}$ [$\frac{1}{a+2}$, a≠±2 ]

b) $\frac{1}{3+b}+\frac{6}{b^{2}-9}-\frac{5}{3-b}+1$ [$\frac{b+3}{b-3}$, b≠±3 ]

c) $\frac{c-3}{c}-\frac{c}{2+c}+\frac{c+6}{c^{2}+2c}$ [$\frac{1}{c} ,$ c≠0, c≠-2]

d) $\frac{1}{5-n}-\frac{15n}{125-n^{3}}$ [$\frac{5-n}{25+5n+n^{2}}$, n≠5]

e) $\frac{1}{r+6}+\frac{18r}{r^{3}+216}$ [$\frac{r+6}{r^{2}-6r+36}$, r≠-6]

f)$\left(\frac{m+3}{m}+\frac{m}{3-m}+\frac{9}{m^{2}-3m}\right)∙\frac{m^{2}-9}{m^{3}-27}$ [0, m≠0,m≠3 ]

g) $\frac{n}{n^{2}+25+10n}:\left(\frac{3n}{5+n}+\frac{2n}{n-2}+\frac{4n^{2}}{25-n^{2}}\right)$ [$\frac{1}{n+5}$, n≠±5, n≠0 ]

h) $\frac{\frac{64}{x^{2}}+1+\frac{16}{x}}{1+\frac{8}{x}}$ [$\frac{8+x}{x}$, x≠0, x≠-8 ]

 i) $\frac{\frac{100}{a^{2}}-1}{\frac{1}{a}-\frac{10}{a^{2}}}$ [-10-a, a≠0,a≠10]

11. Vypočtěte a uveďte, kdy má daný výraz smysl:

* 1. ( [1; a≠b; a≠0]
	2. ( [ a ≠±2]
	3. (1 + [ a≠± 1]
	4.  [; a≠±1; a≠1/2]

12. V úlohách zjednodušte

 a) $\frac{x^{4}-27x}{5x^{3}+15x^{2}+45x}$ [$\frac{x-3}{5},x\ne 0$]

 b) $\frac{\left(a-4\right)^{2}-25}{a^{3}+2a^{2}+a}$ [$\frac{a-9}{a\left(a+1\right)},a\ne 0, a\ne -1$ ]

 c) $\frac{3y^{3}-6y^{2}+12y}{y^{3}+8}$ [$\frac{3y}{y+2},y\ne -2$]

 d) $\frac{6x+6m-18}{x^{2}-m^{2}-3x+3m}$ [$\frac{6}{x-m},x\ne m, x\ne 3-m$]

 e) $\frac{x^{2}-16}{2x^{4}}∙\frac{10x^{3}}{20-5x}$ [- $\frac{x+4}{x},x\ne 0, x\ne 4$]

 f) $\frac{n^{3}+1}{1+2n+n^{2}}∙\frac{n+1}{3n^{2}+3-3n}$ [$ \frac{1}{3}$ , n≠-1]

 g) $\frac{\left(r+2\right)^{2}}{3}∙\frac{3r^{2}-12r+12}{r^{3}+4r^{2}+4r}∙\frac{r}{\left(r-2\right)^{3 }}$ [ $\frac{1}{r-2},r\ne \pm 2, r\ne 0$]

 h) $\frac{4x^{2}-4x+4}{2x}∙\frac{x^{3}+2x^{2}+x}{x^{5}-x^{3}+x^{2}-1}$ [$\frac{2}{x-1},x\ne 0,x\ne \pm 1$]

 i) $\frac{\left(x-5\right)^{2}-1}{5x-30}:\frac{x^{3}-16x}{20x^{2}}$ [$\frac{4x}{x+4},x\ne 0, x\ne \pm 4, x\ne 6$]

návod – výrazy v čitatelích a jmenovatelích zlomků rozložte na součiny, potom kraťte

12. Zjednodušte:

a) $\frac{6y-12-5xy+10x}{3y^{2}+12-12y}\left(2-y\right)$ [$\frac{5x-6}{3},y\ne 2$ ]

b) $\frac{36-\left(k+5\right)^{2}}{2-2k^{3}}:\frac{55+5k}{k^{3}+k^{2}+k}$ [$\frac{k}{10},k\ne 1, k\ne -11, k\ne 0$]

c) $\frac{2d}{2d+3}-\frac{4d^{2}+9}{4d^{2}-9}-\frac{5}{2d-3}$ [$\frac{8}{3-2d},d\ne \pm \frac{3}{2}$]

 d) $\left(\frac{2n-1}{n^{2}-1}-\frac{2}{n}+\frac{3}{2n^{2}+2n}\right):\frac{1+n+n^{2}}{n^{3}-1}$ [$\frac{1}{2n},n\ne 0,n\ne \pm 1$]

13. Zjednodušte:

 a) $\frac{12}{a^{2}-4}-\frac{3}{a-2}+\frac{4}{2+a}$ [$\frac{1}{a+2},a\ne \pm 2$]

 b) $\frac{1}{3+b}+\frac{6}{b^{2}-9}-\frac{5}{3-b}+1$ [$\frac{b+3}{b-3},b\ne \pm 3$]

 c) $\frac{c-2}{c}-\frac{c}{2+c}+\frac{c+6}{c^{2}+2c}$ [$\frac{1}{c}$, c≠0,c≠-2]

 d) -$\frac{4}{d-10}-\frac{8d}{100-d^{2}}-\frac{5}{10+d}$ [$\frac{-1}{10+d},d\ne \pm 10$]

 e) $\frac{1}{5-n}-\frac{15n}{125-n^{3}}$ [$\frac{5-n}{25+5n+n^{2}}$, n≠5]

 f) $\frac{1}{d+8}-\frac{1-d}{d^{2}-8d+64}-\frac{d^{2}+7d-8}{d^{3}+512}$ [$\frac{1}{d+8},d\ne -8$]

 g) $\frac{1}{r+6}+\frac{18r}{r^{3}+216}$ [$\frac{r+6}{r^{2}-6r+36},r\ne -6$]

 h) $\left(\frac{m+3}{m}+\frac{m}{3-m}+\frac{9}{m^{2}-3m}\right)$∙$\frac{m^{2}-9}{m^{3}-27}$ [0, m≠0,m≠3]

 i) $\frac{n}{n^{2}+25+10n}:\left(\frac{3n}{5+n}+\frac{2n}{n-5}+\frac{4n^{2}}{25-n^{2}}\right)$ [$\frac{1}{n+5},n\ne \pm 5, n\ne 0$]

 j) $\left(\frac{s}{s-6}-\frac{3}{s+6}+\frac{s^{2}}{36-s^{2}}\right):\frac{3}{s^{3}-216}$ [$s^{2}+6s+36, s\ne \pm 6$]

14. Vypočítejte:

a) $\frac{\frac{64}{x^{2}}+1+\frac{16}{x}}{1+\frac{8}{x}}$ [$\frac{8+x}{x},x\ne 0, x\ne -8$]

b) $\frac{\frac{100}{a^{2}}-1}{\frac{1}{a}-\frac{10}{a^{2}}}$ [-10-a, a≠0, a≠10]

c) $\frac{\frac{m}{3}+\frac{27}{m}+3}{\frac{m}{9}-\frac{81}{m^{2}}}$ [$\frac{3m}{m-9},m\ne 0, m\ne 9$]

d) $\frac{\frac{s^{2}}{2}+\frac{32}{s}}{\frac{s}{4}+\frac{4}{s}-1}$ [2$\left(s+4\right), s\ne 0$]

15. Zjednodušte:

a) $\frac{m^{5}+m^{12}}{m^{-5}+m^{-12}}$ [$m^{17}, m\ne 0, m\ne -1$]

b) $\frac{b^{29}-b^{21}}{b^{-21}-b^{-29}}$ [$b^{50}$, b≠0, b≠±1]

c) $\left(7^{-2}+x^{-2}\right)^{-1}$∙$\left(\frac{7x}{49+x^{2}}\right)^{-2}$ [49+$x^{2}$; x≠0]

d) $\left[\frac{\left(s-2\right)^{-1}}{s^{-3}}+2^{3}∙\left(2-s\right)^{-1}\right]^{-1}$ [$\frac{1}{s^{2}+2s+4}$, s≠0, s≠2]

e) $\frac{\sqrt{3}-\sqrt{7}}{\sqrt{3}+\sqrt{7}}-\frac{\sqrt{3}+\sqrt{7}}{\sqrt{3}-\sqrt{7}}$ [$\sqrt{21, }$ ]

f) $\frac{\sqrt{x}+2\sqrt{y}}{\sqrt{x}-2\sqrt{y}}+\frac{\sqrt{x}-2\sqrt{y}}{2\sqrt{y}+\sqrt{x}}$ [$\frac{2\left(x+4y\right)}{x-4y}$, x≥0, y≥0, x≠4y]

g) $\frac{c-\sqrt{12c}+3}{c-3}:\left(\sqrt{c^{\frac{1}{2}}+\sqrt[5]{3^{\frac{5}{2}}}}\right)^{-2}$ [$\sqrt{c}-\sqrt{3}$, c≥0, c≠3]

h) $\sqrt{\frac{r}{5}+\frac{5}{r}-2}:\sqrt{\frac{r}{5}+\frac{5}{r}+2}$ [$\left|\frac{r-5}{r+5}\right|$, r>0, r≠-5 ]