Referát

Mgr. Jaroslav Drobek, Ph. D.

Katedra matematiky a deskriptivní geometrie

Bakalářská matematika II

Pohyb hmotného bodu

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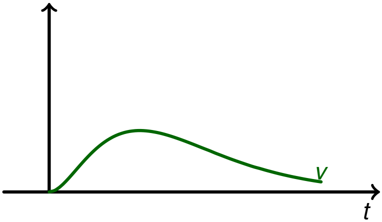

- Rychlost v závislosti na čase . . . $v(t)$

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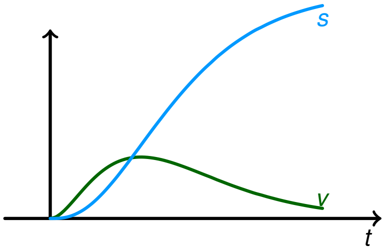

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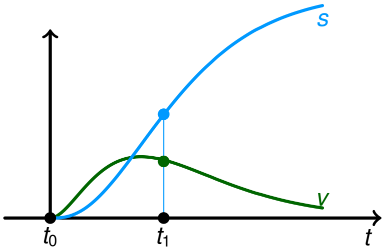

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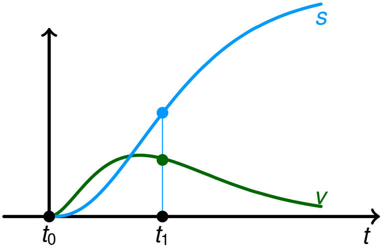

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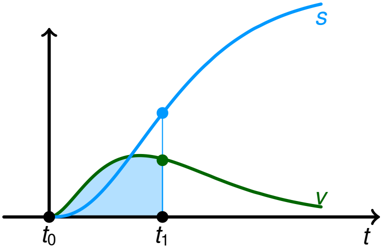

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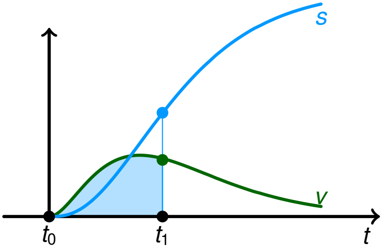

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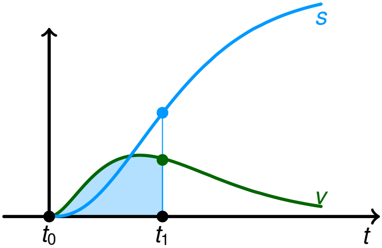

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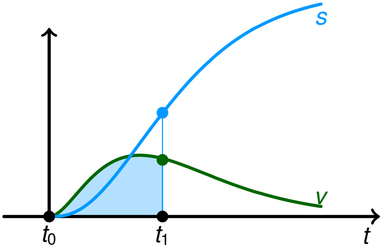

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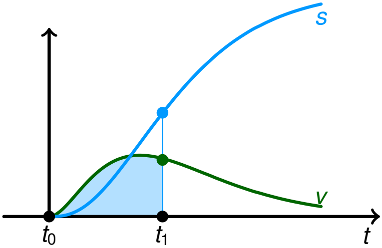

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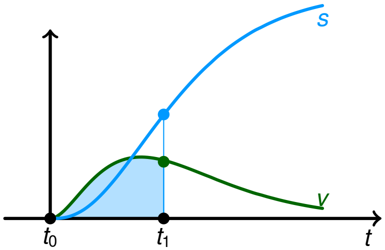

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„rychlost je derivací dráhy“

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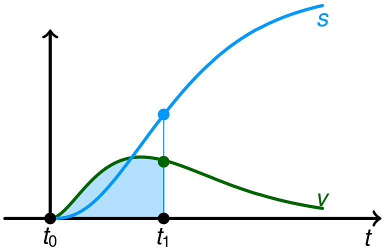

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„rychlost je derivací dráhy“ „dráha je integrálem rychlosti“

Primitivní funkce a neurčitý integrál

$$v \sim f$$

Primitivní funkce a neurčitý integrál

$$v \sim f, \qquad s \sim F$$

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neurčitý integrál	integrand

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pravidla

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pravidla a vzorce

$\boxed{\int cf = c\int f}$ $\boxed{\int a^x\,\mathrm{d}x = \frac{a^x}{\ln a} + c \quad (a > 0,\ a \neq 1)}$

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$$\int \frac{2^x}{3}\,\mathrm{d}x = \frac{1}{3}\int 2^x\,\mathrm{d}x = \underline{\underline{\frac{1}{3}\frac{2^x}{\ln 2} + c}}$$

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$$\int \left(x + \frac{1}{x} + \sqrt{x} + \frac{1}{\sqrt{x}}\right)\mathrm{d}x$$

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$\boxed{\int (f \pm g) = \int f \pm \int g}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c\ (n \neq -1)}$ $\boxed{\int \frac{1}{x}\,\mathrm{d}x = \ln|x| + c\ (n = 1)}$

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$$= \frac{x^2}{2} + \ln|x| + \frac{x^{\frac{3}{2}}}{\frac{3}{2}} + \frac{x^{\frac{1}{2}}}{\frac{1}{2}} + c = \underline{\underline{\frac{1}{2}x^2 + \ln|x| + \frac{2}{3}\sqrt{x^3} + 2\sqrt{x} + c}}$$

pravidla a vzorce

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$$\int (8\cos x - 3\sin x)\,\mathrm{d}x$$

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$\boxed{\int \cos x\,\mathrm{d}x = \sin x + c}$ $\boxed{\int \sin x\,\mathrm{d}x = -\cos x + c}$

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Příklad 1.4:

$$\int \frac{4}{\sqrt{4-4x^2}}\,\mathrm{d}x$$

Příklad 1.3:

$$\int (8\cos x - 3\sin x)\,\mathrm{d}x = \underline{\underline{8\sin x + 3\cos x + c}}$$

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Příklad 1.4:

$$\int \frac{4}{\sqrt{4-4x^2}}\,\mathrm{d}x = \frac{4}{2}\int \frac{1}{\sqrt{1-x^2}}\,\mathrm{d}x$$

Příklad 1.3:

$$\int (8\cos x - 3\sin x)\,\mathrm{d}x = \underline{\underline{8\sin x + 3\cos x + c}}$$

vzorce

$\boxed{\int \cos x\,\mathrm{d}x = \sin x + c}$ $\boxed{\int \sin x\,\mathrm{d}x = -\cos x + c}$

Příklad 1.4:

$$\int \frac{4}{\sqrt{4-4x^2}}\,\mathrm{d}x = \frac{4}{2}\int \frac{1}{\sqrt{1-x^2}}\,\mathrm{d}x$$

vzorce

$\boxed{\int \frac{1}{\sqrt{1-x^2}}\,\mathrm{d}x = \arcsin x + c}$

Příklad 1.3:

$$\int (8\cos x - 3\sin x)\,\mathrm{d}x = \underline{\underline{8\sin x + 3\cos x + c}}$$

vzorce

$$\boxed{\int \cos x\,\mathrm{d}x = \sin x + c} \quad \boxed{\int \sin x\,\mathrm{d}x = -\cos x + c}$$

Příklad 1.4:

$$\int \frac{4}{\sqrt{4-4x^2}}\,\mathrm{d}x = \frac{4}{2}\int \frac{1}{\sqrt{1-x^2}}\,\mathrm{d}x = \underline{\underline{2\arcsin x + c}}$$

vzorce

$$\boxed{\int \frac{1}{\sqrt{1-x^2}}\,\mathrm{d}x = \arcsin x + c}$$

Příklad 1.5:

$$\int \frac{4x-8}{2x^2-8x+7}\,\mathrm{d}x$$

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$$\int \frac{4x-8}{2x^2-8x+7}\,\mathrm{d}x$$

vzorce

$$\boxed{\int \frac{f'(x)}{f(x)}\,\mathrm{d}x = \ln|f(x)| + c}$$

Příklad 1.5:

$$\int \frac{4x-8}{2x^2-8x+7}\,\mathrm{d}x = \underline{\underline{\ln\left|2x^2-8x+7\right|+c}}$$

vzorce

$$\boxed{\int \frac{f'(x)}{f(x)}\,\mathrm{d}x = \ln|f(x)| + c}$$

Příklad 1.5:

$$\int \frac{4x-8}{2x^2-8x+7}\,\mathrm{d}x = \underline{\underline{\ln\left|2x^2-8x+7\right|+c}}$$

vzorce

$$\boxed{\int \frac{f'(x)}{f(x)}\,\mathrm{d}x = \ln|f(x)|+c}$$

Příklad 1.6:

$$\int \operatorname{tg} x\,\mathrm{d}x$$

Příklad 1.5:

$$\int \frac{4x-8}{2x^2-8x+7}\,\mathrm{d}x = \underline{\underline{\ln\left|2x^2-8x+7\right|+c}}$$

vzorce

$$\boxed{\int \frac{f'(x)}{f(x)}\,\mathrm{d}x = \ln|f(x)|+c}$$

Příklad 1.6:

$$\int \operatorname{tg} x\,\mathrm{d}x = -\int \frac{-\sin x}{\cos x}\,\mathrm{d}x$$

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$$\int \frac{4x-8}{2x^2-8x+7}\,\mathrm{d}x = \underline{\underline{\ln\left|2x^2-8x+7\right|+c}}$$

vzorce

$$\boxed{\int \frac{f'(x)}{f(x)}\,\mathrm{d}x = \ln|f(x)|+c}$$

Příklad 1.6:

$$\int \operatorname{tg} x\,\mathrm{d}x = -\int \frac{-\sin x}{\cos x}\,\mathrm{d}x = \underline{\underline{-\ln|\cos x|+c}}$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'}$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \left(F(x)+c\right)'$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)'$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0 = f(x)$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'}_{} = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0 = \underbrace{f(x)}_{}$$

$$\ldots \quad \boxed{\left(\int f\right)' = f}$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'} = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0 = \underbrace{f(x)}$$

$$\dots \quad \boxed{\left(\int f\right)' = f}$$

a obráceně: $\underbrace{\int (F(x))'\,\mathrm{d}x}$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'} = \big(F(x)+c\big)' = \big(F(x)\big)' + (c)' = f(x) + 0 = \underbrace{f(x)}$$

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a obráceně: $$\underbrace{\int (F(x))'\,\mathrm{d}x} = \int f(x)\,\mathrm{d}x$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'}_{\sim} = \big(F(x)+c\big)' = \big(F(x)\big)' + (c)' = f(x) + 0 = \underbrace{f(x)}_{\sim}$$

$$\ldots \quad \boxed{\left(\int f\right)' = f}$$

a obráceně: $$\underbrace{\int (F(x))'\,\mathrm{d}x}_{\sim} = \int f(x)\,\mathrm{d}x = \underbrace{F(x)+c}_{\sim}$$

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$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'} = \big(F(x)+c\big)' = \big(F(x)\big)' + (c)' = f(x) + 0 = \underbrace{f(x)}$$

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$$\dots \quad \boxed{\int F' = F + c}$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0 = f(x)$$

$$\dots \boxed{\left(\int f\right)' = f}$$

a obráceně: $$\int (F(x))'\,\mathrm{d}x = \int f(x)\,\mathrm{d}x = F(x) + c$$

$$\dots \boxed{\int F' = F + c}$$

Důsledek:

$$f \cdot g + c$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \big(F(x)+c\big)' = \big(F(x)\big)' + (c)' = f(x) + 0 = f(x)$$

$$\ldots \quad \boxed{\left(\int f\right)' = f}$$

a obráceně: $$\int (F(x))'\,\mathrm{d}x = \int f(x)\,\mathrm{d}x = F(x) + c$$

$$\ldots \quad \boxed{\int F' = F + c}$$

Důsledek:

$$f \cdot g + c = \int (f \cdot g)'$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \big(F(x)+c\big)' = \big(F(x)\big)' + (c)' = f(x) + 0 = f(x)$$

$$\ldots \quad \boxed{\left(\textstyle\int f\right)' = f}$$

a obráceně: $$\int (F(x))'\,\mathrm{d}x = \int f(x)\,\mathrm{d}x = F(x) + c$$

$$\ldots \quad \boxed{\textstyle\int F' = F + c}$$

Důsledek:

$$f\cdot g + c = \int (f\cdot g)' = \int (f'\cdot g + f\cdot g')$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'} = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0 = \underbrace{f(x)}$$

$$\ldots\quad \boxed{\left(\textstyle\int f\right)' = f}$$

a obráceně: $$\underbrace{\int (F(x))'\,\mathrm{d}x} = \int f(x)\,\mathrm{d}x = \underbrace{F(x)+c}$$

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Důsledek:

$$\underbrace{f\cdot g + c} = \int (f\cdot g)' = \int (f'\cdot g + f\cdot g') = \underbrace{\int f'\cdot g + \int f\cdot g'}$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\left(\int f(x)\,\mathrm{d}x\right)' = \big(F(x)+c\big)' = \big(F(x)\big)' + (c)' = f(x) + 0 = f(x)$$

$$\ldots \quad \boxed{\left(\int f\right)' = f}$$

a obráceně: $$\int (F(x))'\,\mathrm{d}x = \int f(x)\,\mathrm{d}x = F(x) + c$$

$$\ldots \quad \boxed{\int F' = F + c}$$

Důsledek:

$$f\cdot g + c = \int (f\cdot g)' = \int (f'\cdot g + f\cdot g') = \int f'\cdot g + \int f\cdot g'$$

$$\ldots \quad \boxed{\int f'\cdot g = f\cdot g - \int f\cdot g'}$$

Pozorování: Je-li F primitivní funkcí k f, potom

$$\underbrace{\left(\int f(x)\,\mathrm{d}x\right)'} = \left(F(x)+c\right)' = \left(F(x)\right)' + (c)' = f(x) + 0 = \underbrace{f(x)}$$

$$\ldots \boxed{\left(\textstyle\int f\right)' = f}$$

a obráceně: $$\underbrace{\int (F(x))'\,\mathrm{d}x} = \int f(x)\,\mathrm{d}x = \underbrace{F(x)+c}$$

$$\ldots \boxed{\textstyle\int F' = F + c}$$

Důsledek:

$$\underbrace{f\cdot g + c} = \int (f\cdot g)' = \int (f'\cdot g + f\cdot g') = \underbrace{\int f'\cdot g + \int f\cdot g'}$$

$$\ldots \boxed{\textstyle\int f'\cdot g = f\cdot g - \int f\cdot g'}$$

(konstanta se „skrývá“ v integrálu)

Příklad 1.7:

$$\int x^2 \sin x \, \mathrm{d}x$$

Příklad 1.7:

$$\int x^2 \sin x \, \mathrm{d}x$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ & \end{array} \right|$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \, \mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & \end{array} \right|$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \, \mathrm{d}x = \left| \begin{array}{cc} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right|$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \,\mathrm{d}x$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \,\mathrm{d}x = \textbf{?}$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \,\mathrm{d}x = \textbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ & \end{array} \right|$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.7:

$$\int x^2 \sin x \, \mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \, \mathrm{d}x = \textbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \, \mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & \end{array} \right|$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \, \mathrm{d}x = -\cos x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \,\mathrm{d}x = \textbf{?}$$

...jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right|$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$

Příklad 1.7:

$$\int x^2 \sin x \, \mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \, \mathrm{d}x = \textbf{?}$$

…jiná volba:

$$\int x^2 \sin x \, \mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2 \cos x$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \, \mathrm{d}x = -\cos x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \begin{vmatrix} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{vmatrix} = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \mathbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \begin{vmatrix} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{vmatrix} = -x^2 \cos x + \int 2x \cos x \,\mathrm{d}x$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \begin{vmatrix} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{vmatrix} = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \textbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \begin{vmatrix} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{vmatrix} = -x^2\cos x + \int 2x\cos x \,\mathrm{d}x \qquad \textbf{(!)}$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \textbf{?}$$

...jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2 \cos x + \int 2x \cos x \,\mathrm{d}x \qquad \textbf{(!)}$$

$$= \left| \begin{array}{ll} f'(x) = \cos x & g(x) = 2x \\ & \end{array} \right|$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \textbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2\cos x + \int 2x\cos x \,\mathrm{d}x \qquad \textbf{(!)}$$

$$= \left| \begin{array}{ll} f'(x) = \cos x & g(x) = 2x \\ f(x) = \sin x & \end{array} \right|$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$ $\boxed{\int \cos x \,\mathrm{d}x = \sin x + c}$

Příklad 1.7:

$$\int x^2 \sin x \, dx = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \, dx = \mathbf{?}$$

...jiná volba:

$$\int x^2 \sin x \, dx = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2 \cos x + \int 2x \cos x \, dx \qquad \mathbf{(!)}$$

$$= \left| \begin{array}{ll} f'(x) = \cos x & g(x) = 2x \\ f(x) = \sin x & g'(x) = 2 \end{array} \right|$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \, dx = -\cos x + c}$ $\boxed{\int \cos x \, dx = \sin x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \begin{vmatrix} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{vmatrix} = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \mathbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \begin{vmatrix} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{vmatrix} = -x^2\cos x + \int 2x\cos x \,\mathrm{d}x \qquad \mathbf{(!)}$$

$$= \begin{vmatrix} f'(x) = \cos x & g(x) = 2x \\ f(x) = \sin x & g'(x) = 2 \end{vmatrix} = -x^2\cos x$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$ $\boxed{\int \cos x \,\mathrm{d}x = \sin x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3} \sin x - \int \frac{x^3}{3} \cos x \,\mathrm{d}x = \textbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2 \cos x + \int 2x \cos x \,\mathrm{d}x \qquad \textbf{(!)}$$

$$= \left| \begin{array}{ll} f'(x) = \cos x & g(x) = 2x \\ f(x) = \sin x & g'(x) = 2 \end{array} \right| = -x^2 \cos x + \left(2x \sin x \qquad\qquad \right)$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$ $\boxed{\int \cos x \,\mathrm{d}x = \sin x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \dfrac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \textbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2\cos x + \int 2x\cos x \,\mathrm{d}x \qquad \textbf{(!)}$$

$$= \left| \begin{array}{ll} f'(x) = \cos x & g(x) = 2x \\ f(x) = \sin x & g'(x) = 2 \end{array} \right| = -x^2\cos x + \left(2x\sin x - \int 2\sin x \,\mathrm{d}x\right)$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$ $\boxed{\int \cos x \,\mathrm{d}x = \sin x + c}$

Příklad 1.7:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^2 & g(x) = \sin x \\ f(x) = \frac{x^3}{3} & g'(x) = \cos x \end{array} \right| = \frac{x^3}{3}\sin x - \int \frac{x^3}{3}\cos x \,\mathrm{d}x = \mathbf{?}$$

. . . jiná volba:

$$\int x^2 \sin x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \sin x & g(x) = x^2 \\ f(x) = -\cos x & g'(x) = 2x \end{array} \right| = -x^2\cos x + \int 2x\cos x \,\mathrm{d}x \qquad \mathbf{(!)}$$

$$= \left| \begin{array}{ll} f'(x) = \cos x & g(x) = 2x \\ f(x) = \sin x & g'(x) = 2 \end{array} \right| = -x^2\cos x + \left(2x\sin x - \int 2\sin x \,\mathrm{d}x\right)$$

$$= \underline{\underline{-x^2\cos x + 2x\sin x + 2\cos x + c}}$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int \sin x \,\mathrm{d}x = -\cos x + c}$ $\boxed{\int \cos x \,\mathrm{d}x = \sin x + c}$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2} \ln x \,\mathrm{d}x$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2} \ln x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ & \end{array} \right|$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'}$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2} \ln x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\dfrac{1}{x} & \end{array} \right|$$

pravidla a vzorce

$$\boxed{\int f'g = fg - \int fg'} \qquad \boxed{\int x^n \,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2} \ln x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\dfrac{1}{x} & g'(x) = \dfrac{1}{x} \end{array} \right|$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n \,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2} \ln x \,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\frac{1}{x} & g'(x) = \frac{1}{x} \end{array} \right| = -\frac{1}{x} \ln x$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n \,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\frac{1}{x} & g'(x) = \frac{1}{x} \end{array} \right| = -\frac{1}{x}\ln x + \int \frac{1}{x}\cdot\frac{1}{x}\,\mathrm{d}x$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\frac{1}{x} & g'(x) = \frac{1}{x} \end{array} \right| = -\frac{1}{x}\ln x + \int \frac{1}{x}\cdot\frac{1}{x}\,\mathrm{d}x$$

$$= -\frac{1}{x}\ln x + \int x^{-2}\,\mathrm{d}x$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\frac{1}{x} & g'(x) = \frac{1}{x} \end{array} \right| = -\frac{1}{x}\ln x + \int \frac{1}{x}\cdot\frac{1}{x}\,\mathrm{d}x$$

$$= -\frac{1}{x}\ln x + \int x^{-2}\,\mathrm{d}x = \underline{\underline{-\frac{1}{x}\ln x - \frac{1}{x} + c}}$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\frac{1}{x} & g'(x) = \frac{1}{x} \end{array} \right| = -\frac{1}{x}\ln x + \int \frac{1}{x}\cdot\frac{1}{x}\,\mathrm{d}x$$

$$= -\frac{1}{x}\ln x + \int x^{-2}\,\mathrm{d}x = \underline{\underline{-\frac{1}{x}\ln x - \frac{1}{x} + c}}$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

. . . jiná volba:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \left| \begin{array}{ll} f'(x) = \ln x & g(x) = x^{-2} \\ f(x) = \mathbf{?} & \end{array} \right|$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \begin{vmatrix} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\frac{1}{x} & g'(x) = \frac{1}{x} \end{vmatrix} = -\frac{1}{x}\ln x + \int \frac{1}{x}\cdot\frac{1}{x}\,\mathrm{d}x$$

$$= -\frac{1}{x}\ln x + \int x^{-2}\,\mathrm{d}x = \underline{\underline{-\frac{1}{x}\ln x - \frac{1}{x} + c}}$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

...jiná volba:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \begin{vmatrix} f'(x) = \ln x & g(x) = x^{-2} \\ f(x) = \textbf{?} & g'(x) = -2x^{-3} \end{vmatrix}$$

Příklad 1.8:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \begin{vmatrix} f'(x) = x^{-2} & g(x) = \ln x \\ f(x) = -\dfrac{1}{x} & g'(x) = \dfrac{1}{x} \end{vmatrix} = -\frac{1}{x}\ln x + \int \frac{1}{x}\cdot\frac{1}{x}\,\mathrm{d}x$$

$$= -\frac{1}{x}\ln x + \int x^{-2}\,\mathrm{d}x = \underline{\underline{-\frac{1}{x}\ln x - \frac{1}{x} + c}}$$

pravidla a vzorce

$\boxed{\int f'g = fg - \int fg'}$ $\boxed{\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c}$

. . . jiná volba:

$$\int \frac{\ln x}{x^2}\,\mathrm{d}x = \int x^{-2}\ln x\,\mathrm{d}x = \begin{vmatrix} f'(x) = \ln x & g(x) = x^{-2} \\ f(x) = \textbf{?} & g'(x) = -2x^{-3} \end{vmatrix}$$

. . . nevhodná

Příklad 1.9:

$$\int \frac{e^{2x} - 1}{e^{x}} \,\mathrm{d}x$$

Příklad 1.9:

$$\int \frac{e^{2x} - 1}{e^x} \, \mathrm{d}x = \left| \begin{array}{c} t = e^x \\ \\ \\ \\ \end{array} \right|$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left|\begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \\ \\ \end{array}\right|$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \\ \end{array} \right|$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right|$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \dfrac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \dfrac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^{x}}\,\mathrm{d}x = \left| \begin{array}{c} t = e^{x} \\ (t)'\,\mathrm{d}t = (e^{x})'\,\mathrm{d}x \\ \mathrm{d}t = e^{x}\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^{2}-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

$$= \underline{\underline{e^{x} + e^{-x} + c}}$$

Příklad 1.9:

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$$= \underline{\underline{e^x + e^{-x} + c}}$$

Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

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$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \\ \\ \end{array} \right|$$

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Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \\ \end{array} \right|$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

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Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right|$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

$$= \underline{\underline{e^x + e^{-x} + c}}$$

Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

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Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t = \frac{1}{7}\sin t + c$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

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Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t = \frac{1}{7}\sin t + c = \underline{\underline{\frac{1}{7}\sin(7x-5) + c}}$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

$$= \underline{\underline{e^x + e^{-x} + c}}$$

Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t = \frac{1}{7}\sin t + c = \underline{\underline{\frac{1}{7}\sin(7x-5)+c}}$$

$$\boxed{F' = f \implies \int f(ax+b)\,\mathrm{d}x = \frac{1}{a}F(ax+b)+c}$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

$$= \underline{\underline{e^x + e^{-x} + c}}$$

Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t = \frac{1}{7}\sin t + c = \underline{\underline{\frac{1}{7}\sin(7x-5)+c}}$$

$$\boxed{F' = f \implies \int f(ax+b)\,\mathrm{d}x = \tfrac{1}{a}F(ax+b)+c}$$

Příklad 1.11:

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

$$= \underline{\underline{e^x + e^{-x} + c}}$$

Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t = \frac{1}{7}\sin t + c = \underline{\underline{\frac{1}{7}\sin(7x-5)+c}}$$

$$\boxed{F' = f \implies \int f(ax+b)\,\mathrm{d}x = \tfrac{1}{a}F(ax+b)+c}$$

Příklad 1.11:

$$\int \frac{1}{3x+4}\,\mathrm{d}x$$

Příklad 1.9:

$$\int \frac{e^{2x}-1}{e^x}\,\mathrm{d}x = \left| \begin{array}{c} t = e^x \\ (t)'\,\mathrm{d}t = (e^x)'\,\mathrm{d}x \\ \mathrm{d}t = e^x\,\mathrm{d}x \\ \frac{1}{t}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{t^2-1}{t}\cdot\frac{1}{t}\,\mathrm{d}t = \int (1-t^{-2})\,\mathrm{d}t = t - \frac{t^{-1}}{-1} + c$$

$$= \underline{\underline{e^x + e^{-x} + c}}$$

Příklad 1.10:

$$\int \cos(7x-5)\,\mathrm{d}x = \left| \begin{array}{c} t = 7x-5 \\ \mathrm{d}t = 7\,\mathrm{d}x \\ \frac{1}{7}\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \frac{1}{7}\int \cos t\,\mathrm{d}t = \frac{1}{7}\sin t + c = \underline{\underline{\frac{1}{7}\sin(7x-5) + c}}$$

$$\boxed{F' = f \implies \int f(ax+b)\,\mathrm{d}x = \tfrac{1}{a}F(ax+b) + c}$$

Příklad 1.11:

$$\int \frac{1}{3x+4}\,\mathrm{d}x = \underline{\underline{\frac{1}{3}\ln|3x+4|\,x + c}}$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2 + 2x + 10}$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2+2x+10} = \left| \begin{array}{l} x^2+2x+10 \\ = \underbrace{x^2+2x+1^2}{} - 1^2 + 10 \\ \\ \\ \end{array} \right|$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2+2x+10} = \left| \begin{array}{l} x^2+2x+10 \\ = \underbrace{x^2+2x+1^2}-1^2+10 \\ = (x+1)^2+9 \\ \end{array} \right|$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2+2x+10} = \left| \begin{array}{l} x^2+2x+10 \\ = \underbrace{x^2+2x+1^2}-1^2+10 \\ = (x+1)^2+9 \\ = (x+1)^2+3^2 \end{array} \right|$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2+2x+10} = \left| \begin{array}{l} x^2+2x+10 \\ = \underbrace{x^2+2x+1^2}-1^2+10 \\ = (x+1)^2+9 \\ = (x+1)^2+3^2 \end{array} \right| = \int \frac{\mathrm{d}x}{(x+1)^2+3^2}$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2+2x+10} = \left| \begin{aligned} & x^2+2x+10 \\ & = \underbrace{x^2+2x+1^2}-1^2+10 \\ & = (x+1)^2+9 \\ & = (x+1)^2+3^2 \end{aligned} \right| = \int \frac{\mathrm{d}x}{(x+1)^2+3^2}$$

vzorce

$$\boxed{\int \frac{1}{a^2+x^2}\,\mathrm{d}x = \frac{1}{a}\operatorname{arctg}\frac{x}{a}+c \quad (a \neq 0)}$$

Příklad 1.12:

$$\int \frac{\mathrm{d}x}{x^2+2x+10} = \left| \begin{array}{l} x^2+2x+10 \\ = \underbrace{x^2+2x+1^2}-1^2+10 \\ = (x+1)^2+9 \\ = (x+1)^2+3^2 \end{array} \right| = \int \frac{\mathrm{d}x}{(x+1)^2+3^2}$$

$$= \underline{\underline{\frac{1}{3}\,\mathrm{arctg}\,\frac{x+1}{3}+c}}$$

vzorce

$$\boxed{\int \frac{1}{a^2+x^2}\,\mathrm{d}x = \frac{1}{a}\,\mathrm{arctg}\,\frac{x}{a}+c \quad (a \neq 0)}$$

Příklad 1.13:

$$\int \frac{3x}{2x^2+4x+20}\,\mathrm{d}x$$

Příklad 1.13:

$$\int \frac{3x}{2x^2+4x+20}\,\mathrm{d}x = \frac{3}{4}\int \frac{2x}{x^2+2x+10}\,\mathrm{d}x$$

Příklad 1.13:

$$\int \frac{3x}{2x^2+4x+20}\,\mathrm{d}x = \frac{3}{4}\int \frac{2x}{x^2+2x+10}\,\mathrm{d}x$$
$$= \frac{3}{4}\left(\int \frac{2x+2}{x^2+2x+10}\,\mathrm{d}x - 2\int \frac{\mathrm{d}x}{x^2+2x+10}\right)$$

Příklad 1.13:

$$\begin{aligned}\int \frac{3x}{2x^2+4x+20}\,\mathrm{d}x &= \frac{3}{4}\int \frac{2x}{x^2+2x+10}\,\mathrm{d}x \\ &= \frac{3}{4}\left(\int \frac{2x+2}{x^2+2x+10}\,\mathrm{d}x - 2\int \frac{\mathrm{d}x}{x^2+2x+10}\right) \\ &\overset{\text{Př 1.12}}{=} \frac{3}{4}\left(\ln\left|x^2+2x+10\right| - 2\frac{1}{3}\operatorname{arctg}\frac{x+1}{3} + c\right)\end{aligned}$$

Příklad 1.13:

$$\int \frac{3x}{2x^2+4x+20}\,\mathrm{d}x = \frac{3}{4}\int \frac{2x}{x^2+2x+10}\,\mathrm{d}x$$

$$= \frac{3}{4}\left(\int \frac{2x+2}{x^2+2x+10}\,\mathrm{d}x - 2\int \frac{\mathrm{d}x}{x^2+2x+10}\right)$$

$$\overset{\text{Př 1.12}}{=} \frac{3}{4}\left(\ln\left|x^2+2x+10\right| - 2\frac{1}{3}\operatorname{arctg}\frac{x+1}{3} + c\right)$$

$$= \underline{\underline{\frac{3}{4}\ln(x^2+2x+10) - \frac{1}{2}\operatorname{arctg}\frac{x+1}{3} + c}}$$

Příklad 1.14:

$$\int \frac{5x - 14}{x^3 - x^2 - 4x + 4} \, \mathrm{d}x$$

Příklad 1.14:

$$\int \frac{5x-14}{x^3-x^2-4x+4}\,\mathrm{d}x$$

$$\frac{5x-14}{x^3-x^2-4x+4} = \frac{3}{x-1} - \frac{1}{x-2} - \frac{2}{x+2}$$

výpočet

Příklad 1.14:

$$\int \frac{5x-14}{x^3-x^2-4x+4}\,\mathrm{d}x \overset{\spadesuit}{=} \int \left(\frac{3}{x-1}-\frac{1}{x-2}-\frac{2}{x+2}\right)\mathrm{d}x$$

$\spadesuit$ $$\frac{5x-14}{x^3-x^2-4x+4} = \frac{3}{x-1}-\frac{1}{x-2}-\frac{2}{x+2}$$

výpočet

Příklad 1.14:

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$$= \underline{\underline{3\ln|x-1|-\ln|x-2|-2\ln|x+2|+c}}$$

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výpočet

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výpočet

Příklad 1.15:

$$\int \frac{x^3+1}{x^4-3x^3+3x^2-x}\,\mathrm{d}x$$

Příklad 1.14:

$$\int \frac{5x-14}{x^3-x^2-4x+4}\,\mathrm{d}x \overset{\spadesuit}{=} \int \left(\frac{3}{x-1} - \frac{1}{x-2} - \frac{2}{x+2} \right) \mathrm{d}x$$

$$= \underline{\underline{3\ln|x-1| - \ln|x-2| - 2\ln|x+2| + c}}$$

$$\spadesuit \qquad \frac{5x-14}{x^3-x^2-4x+4} = \frac{3}{x-1} - \frac{1}{x-2} - \frac{2}{x+2}$$

výpočet

Příklad 1.15:

$$\int \frac{x^3+1}{x^4-3x^3+3x^2-x}\,\mathrm{d}x$$

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

výpočet

Příklad 1.14:

$$\int \frac{5x-14}{x^3-x^2-4x+4}\,\mathrm{d}x \overset{\spadesuit}{=} \int \left(\frac{3}{x-1} - \frac{1}{x-2} - \frac{2}{x+2} \right) \mathrm{d}x$$

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výpočet

Příklad 1.15:

$$\int \frac{x^3+1}{x^4-3x^3+3x^2-x}\,\mathrm{d}x \overset{\diamondsuit}{=} \int \left(-\frac{1}{x} + \frac{2}{x-1} + \frac{1}{(x-1)^2} + \frac{2}{(x-1)^3} \right) \mathrm{d}x$$

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

výpočet

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$$\int \frac{5x-14}{x^3-x^2-4x+4}\,\mathrm{d}x \overset{\spadesuit}{=} \int \left(\frac{3}{x-1}-\frac{1}{x-2}-\frac{2}{x+2}\right)\mathrm{d}x$$

$$= \underline{\underline{3\ln|x-1| - \ln|x-2| - 2\ln|x+2| + c}}$$

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výpočet

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$$\int \frac{x^3+1}{x^4-3x^3+3x^2-x}\,\mathrm{d}x \overset{\diamondsuit}{=} \int \left(-\frac{1}{x}+\frac{2}{x-1}+\frac{1}{(x-1)^2}+\frac{2}{(x-1)^3}\right)\mathrm{d}x$$

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

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

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

$$= \underline{\underline{-\ln|x|+2\ln|x-1|-\frac{1}{x-1}-\frac{1}{(x-1)^2}+c}}$$

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výpočet

Příklad 1.16:

$$\int \frac{5x+2}{x^3+2x^2+10x}\,\mathrm{d}x$$

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$$\frac{5x+2}{x^3+2x^2+10x} = \frac{1}{5}\cdot\frac{1}{x} - \frac{1}{10}\cdot\frac{2x+2}{x^2+2x+10} + \frac{24}{5}\cdot\frac{1}{x^2+2x+10}$$

výpočet

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$$\int \frac{5x+2}{x^3+2x^2+10x}\,\mathrm{d}x \overset{\spadesuit}{=} \int \left(\frac{1}{5}\cdot\frac{1}{x} - \frac{1}{10}\cdot\frac{2x+2}{x^2+2x+10} + \frac{24}{5}\cdot\frac{1}{x^2+2x+10} \right)\mathrm{d}x$$

$\spadesuit$ $$\frac{5x+2}{x^3+2x^2+10x} = \frac{1}{5}\cdot\frac{1}{x} - \frac{1}{10}\cdot\frac{2x+2}{x^2+2x+10} + \frac{24}{5}\cdot\frac{1}{x^2+2x+10}$$

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$$= \underline{\underline{\frac{1}{5}\ln|x| - \frac{1}{10}\ln(x^2+2x+10) + \frac{24}{5}\cdot\frac{1}{3}\operatorname{arctg}\frac{x+1}{3} + c}}$$

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výpočet

Příklad 1.17:

$$\int \frac{x^4+3x^3+12x^2+15x+2}{x^3+2x^2+10x}\,\mathrm{d}x$$

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Příklad 1.16:

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$$= \underline{\underline{\frac{1}{5}\ln|x| - \frac{1}{10}\ln(x^2+2x+10) + \frac{24}{5}\cdot\frac{1}{3}\operatorname{arctg}\frac{x+1}{3} + c}}$$

$$\spadesuit \qquad \frac{5x+2}{x^3+2x^2+10x} = \frac{1}{5}\cdot\frac{1}{x} - \frac{1}{10}\cdot\frac{2x+2}{x^2+2x+10} + \frac{24}{5}\cdot\frac{1}{x^2+2x+10}$$

výpočet

Příklad 1.17:

$$\int \frac{x^4+3x^3+12x^2+15x+2}{x^3+2x^2+10x}\,\mathrm{d}x \overset{\diamondsuit}{=} \int \left(x+1+\frac{5x+2}{x^3+2x^2+10x}\right)\mathrm{d}x$$

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Příklad 1.16:

$$\int \frac{5x+2}{x^3+2x^2+10x}\,\mathrm{d}x \overset{\spadesuit}{=} \int \left(\frac{1}{5}\cdot\frac{1}{x} - \frac{1}{10}\cdot\frac{2x+2}{x^2+2x+10} + \frac{24}{5}\cdot\frac{1}{x^2+2x+10}\right)\mathrm{d}x$$
$$= \underline{\underline{\frac{1}{5}\ln|x| - \frac{1}{10}\ln(x^2+2x+10) + \frac{24}{5}\cdot\frac{1}{3}\operatorname{arctg}\frac{x+1}{3} + c}}$$

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Příklad 1.17:

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$$\overset{\text{Př 1.16}}{=} \underline{\underline{\frac{x^2}{2} + x + \frac{1}{5}\ln|x| - \frac{1}{10}\ln(x^2+2x+10) + \frac{8}{5}\operatorname{arctg}\frac{x+1}{3} + c}}$$

$$\diamondsuit \qquad \frac{x^4+3x^3+12x^2+15x+2}{x^3+2x^2+10x} = x+1+\frac{5x+2}{x^3+2x^2+10x}$$

Příklad 1.18:

$$\int \cos^5 x \,\mathrm{d}x$$

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$$\int \cos^5 x \, \mathrm{d}x = \int (\cos^2 x)^2 \cos x \, \mathrm{d}x$$

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vzorce

$$\boxed{\sin^2 x + \cos^2 x = 1}$$

Příklad 1.18:

$$\int \cos^5 x \, \mathrm{d}x = \int (\cos^2 x)^2 \cos x \, \mathrm{d}x = \int (1 - \sin^2 x)^2 \cos x \, \mathrm{d}x$$

vzorce

$$\boxed{\sin^2 x + \cos^2 x = 1}$$

Příklad 1.18:

$$\int \cos^5 x \, \mathrm{d}x = \int (\cos^2 x)^2 \cos x \, \mathrm{d}x = \int (1 - \sin^2 x)^2 \cos x \, \mathrm{d}x = \left| \begin{array}{c} t = \sin x \\ \mathrm{d}t = \cos x \, \mathrm{d}x \end{array} \right|$$

vzorce

$$\boxed{\sin^2 x + \cos^2 x = 1}$$

Příklad 1.18:

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$$= \int (1 - t^2)^2 \,\mathrm{d}t$$

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$$= \int (1 - t^2)^2 \,\mathrm{d}t = \int (1 - 2t^2 + t^4) \,\mathrm{d}t$$

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$$= \int (1-t^2)^2 \,\mathrm{d}t = \int (1-2t^2+t^4) \,\mathrm{d}t = t - \frac{2}{3}t^3 + \frac{1}{5}t^5 + c$$

vzorce

$$\boxed{\sin^2 x + \cos^2 x = 1}$$

Příklad 1.18:

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$$= \underline{\underline{\sin x - \frac{2}{3} \sin^3 x + \frac{1}{5} \sin^5 x + c}}$$

vzorce

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Příklad 1.18:

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vzorce

$$\boxed{\sin^2 x + \cos^2 x = 1}$$

Příklad 1.19:

$$\int \frac{1+\sin x}{1-\sin x}\,\mathrm{d}x$$

Příklad 1.18:

$$\int \cos^5 x \,\mathrm{d}x = \int (\cos^2 x)^2 \cos x \,\mathrm{d}x = \int (1-\sin^2 x)^2 \cos x \,\mathrm{d}x = \left| \begin{array}{c} t = \sin x \\ \mathrm{d}t = \cos x \,\mathrm{d}x \end{array} \right|$$

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Příklad 1.19:

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Příklad 1.18:

$$\int \cos^5 x \, dx = \int (\cos^2 x)^2 \cos x \, dx = \int (1 - \sin^2 x)^2 \cos x \, dx = \left| \begin{array}{c} t = \sin x \\ dt = \cos x \, dx \end{array} \right|$$

$$= \int (1 - t^2)^2 \, dt = \int (1 - 2t^2 + t^4) \, dt = t - \frac{2}{3} t^3 + \frac{1}{5} t^5 + c$$

$$= \underline{\underline{\sin x - \frac{2}{3} \sin^3 x + \frac{1}{5} \sin^5 x + c}}$$

vzorce

$\boxed{\sin^2 x + \cos^2 x = 1}$ $\quad t = \operatorname{tg} \frac{x}{2} \implies$ $\boxed{\frac{2}{t^2+1} \, dt = \, dx}$ $\boxed{\frac{2t}{t^2+1} = \sin x}$ $\boxed{\frac{1-t^2}{t^2+1} = \cos x}$

Příklad 1.19:

$$\int \frac{1 + \sin x}{1 - \sin x} \, dx = \left| t = \operatorname{tg} \frac{x}{2} \right|$$

Příklad 1.18:

$$\int \cos^5 x \, \mathrm{d}x = \int (\cos^2 x)^2 \cos x \, \mathrm{d}x = \int (1 - \sin^2 x)^2 \cos x \, \mathrm{d}x = \left| \begin{array}{c} t = \sin x \\ \mathrm{d}t = \cos x \, \mathrm{d}x \end{array} \right|$$

$$= \int (1 - t^2)^2 \, \mathrm{d}t = \int (1 - 2t^2 + t^4) \, \mathrm{d}t = t - \frac{2}{3} t^3 + \frac{1}{5} t^5 + c$$

$$= \underline{\underline{\sin x - \frac{2}{3} \sin^3 x + \frac{1}{5} \sin^5 x + c}}$$

vzorce

$\boxed{\sin^2 x + \cos^2 x = 1}$ $t = \operatorname{tg} \frac{x}{2} \implies$ $\boxed{\frac{2}{t^2+1} \mathrm{d}t = \mathrm{d}x}$ $\boxed{\frac{2t}{t^2+1} = \sin x}$ $\boxed{\frac{1-t^2}{t^2+1} = \cos x}$

Příklad 1.19:

$$\int \frac{1 + \sin x}{1 - \sin x} \, \mathrm{d}x = \left| t = \operatorname{tg} \frac{x}{2} \right| = \int \frac{1 + \frac{2t}{t^2+1}}{1 - \frac{2t}{t^2+1}} \cdot \frac{2}{t^2 + 1} \, \mathrm{d}t$$

Příklad 1.18:

$$\int \cos^5 x \, dx = \int (\cos^2 x)^2 \cos x \, dx = \int (1-\sin^2 x)^2 \cos x \, dx = \left| \begin{array}{c} t = \sin x \\ dt = \cos x \, dx \end{array} \right|$$

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vzorce

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Příklad 1.18:

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$$= 2\int \frac{t^2+2t+1}{t^2-2t+1} \cdot \frac{1}{t^2+1}\,\mathrm{d}t$$

Příklad 1.18:

$$\int \cos^5 x \,\mathrm{d}x = \int (\cos^2 x)^2 \cos x \,\mathrm{d}x = \int (1-\sin^2 x)^2 \cos x \,\mathrm{d}x = \left| \begin{array}{c} t = \sin x \\ \mathrm{d}t = \cos x \,\mathrm{d}x \end{array} \right|$$

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vzorce

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$$= 2\int \frac{t^2+2t+1}{t^2-2t+1} \cdot \frac{1}{t^2+1}\,\mathrm{d}t = 2\int \frac{t^2+2t+1}{t^4-2t^3+2t^2-2t+1}\,\mathrm{d}t$$

Příklad 1.18:

$$\int \cos^5 x \,\mathrm{d}x = \int (\cos^2 x)^2 \cos x \,\mathrm{d}x = \int (1-\sin^2 x)^2 \cos x \,\mathrm{d}x = \left| \begin{array}{c} t = \sin x \\ \mathrm{d}t = \cos x \,\mathrm{d}x \end{array} \right|$$

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vzorce

$\boxed{\sin^2 x + \cos^2 x = 1}$ $\qquad t = \operatorname{tg}\frac{x}{2} \implies \boxed{\frac{2}{t^2+1}\,\mathrm{d}t = \mathrm{d}x}$ $\boxed{\frac{2t}{t^2+1} = \sin x}$ $\boxed{\frac{1-t^2}{t^2+1} = \cos x}$

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$$= \cdots$$

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$$= 2\int \frac{t^2+2t+1}{t^2-2t+1} \cdot \frac{1}{t^2+1}\,dt = 2\int \frac{t^2+2t+1}{t^4-2t^3+2t^2-2t+1}\,dt$$

$$= \cdots = 2\left(-\frac{2}{t-1} - \operatorname{arctg} t\right) + c$$

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vzorce

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$$= \cdots = 2 \left(-\frac{2}{t-1} - \operatorname{arctg} t \right) + c = \underline{\underline{\frac{4}{1 - \operatorname{tg} \frac{x}{2}} - x + c}}$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}}$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{aligned} t^2 &= 1+x \\ 2t\,\mathrm{d}t &= \mathrm{d}x \end{aligned} \right|$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{array}{r} t^2 = 1+x \\ 2t\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{2t}{(t^2+1)t}\,\mathrm{d}t$$

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$$= \underline{\underline{2\,\mathrm{arctg}\sqrt{1+x} + c}}$$

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$$= \underline{\underline{2\operatorname{arctg}\sqrt{1+x} + c}}$$

Příklad 1.21:

$$\int \frac{\mathrm{d}x}{\sqrt{x} + \sqrt[4]{x}}$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{array}{r} t^2 = 1+x \\ 2t\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{2t}{(t^2+1)t}\,\mathrm{d}t = 2\int \frac{\mathrm{d}t}{t^2+1} = 2\,\mathrm{arctg}\, t + c$$

$$= \underline{\underline{2\,\mathrm{arctg}\sqrt{1+x} + c}}$$

Příklad 1.21:

$$\int \frac{\mathrm{d}x}{\sqrt{x}+\sqrt[4]{x}} = \left| \begin{array}{r} t^4 = x \\ 4t^3\,\mathrm{d}t = \mathrm{d}x \end{array} \right|$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{array}{r} t^2 = 1+x \\ 2t\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{2t}{(t^2+1)t}\,\mathrm{d}t = 2\int \frac{\mathrm{d}t}{t^2+1} = 2\operatorname{arctg} t + c$$
$$= \underline{\underline{2\operatorname{arctg}\sqrt{1+x}+c}}$$

Příklad 1.21:

$$\int \frac{\mathrm{d}x}{\sqrt{x}+\sqrt[4]{x}} = \left| \begin{array}{r} t^4 = x \\ 4t^3\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{4t^3}{t^2+t}\,\mathrm{d}t$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{array}{r} t^2 = 1+x \\ 2t\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{2t}{(t^2+1)t}\,\mathrm{d}t = 2\int \frac{\mathrm{d}t}{t^2+1} = 2\,\mathrm{arctg}\,t + c$$

$$= \underline{\underline{2\,\mathrm{arctg}\sqrt{1+x} + c}}$$

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Příklad 1.20:

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$$= \underline{\underline{2\operatorname{arctg}\sqrt{1+x} + c}}$$

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$$= 4\int \left(t - 1 + \frac{1}{t+1} \right) \mathrm{d}t$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{array}{r} t^2 = 1+x \\ 2t\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{2t}{(t^2+1)t}\,\mathrm{d}t = 2\int \frac{\mathrm{d}t}{t^2+1} = 2\operatorname{arctg} t + c$$

$$= \underline{\underline{2\operatorname{arctg}\sqrt{1+x} + c}}$$

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$$= 4\int \left(t - 1 + \frac{1}{t+1}\right)\mathrm{d}t = 2t^2 - 4t + \ln(t+1) + c$$

Příklad 1.20:

$$\int \frac{\mathrm{d}x}{(2+x)\sqrt{1+x}} = \left| \begin{array}{r} t^2 = 1+x \\ 2t\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{2t}{(t^2+1)t}\,\mathrm{d}t = 2\int \frac{\mathrm{d}t}{t^2+1} = 2\,\mathrm{arctg}\, t + c$$

$$= \underline{\underline{2\,\mathrm{arctg}\,\sqrt{1+x} + c}}$$

Příklad 1.21:

$$\int \frac{\mathrm{d}x}{\sqrt{x}+\sqrt[4]{x}} = \left| \begin{array}{r} t^4 = x \\ 4t^3\,\mathrm{d}t = \mathrm{d}x \end{array} \right| = \int \frac{4t^3}{t^2+t}\,\mathrm{d}t = 4\int \frac{t^2}{t+1}\,\mathrm{d}t$$

$$= 4\int \left(t - 1 + \frac{1}{t+1}\right)\mathrm{d}t = 2t^2 - 4t + \ln(t+1) + c$$

$$= \underline{\underline{2\sqrt{x} - 4\sqrt[4]{x} + \ln(\sqrt[4]{x}+1) + c}}$$

Pravidla pro integrování

$$\int cf = c\int f$$

$$\int (f \pm g) = f \pm g$$

$$\int f'g = fg - \int fg'$$

zpět

Vzorce pro integrování

$$\int 0\,\mathrm{d}x = c$$
$$\int x^n\,\mathrm{d}x = \frac{x^{n+1}}{n+1} + c, \quad n \neq -1$$
$$\int \frac{1}{x}\,\mathrm{d}x = \ln|x| + c$$
$$\int e^x\,\mathrm{d}x = e^x + c$$
$$\int a^x\,\mathrm{d}x = \frac{a^x}{\ln a} + c, \quad a > 0,\ a \neq 1$$
$$\int \sin x\,\mathrm{d}x = \cos x + c$$
$$\int \cos x\,\mathrm{d}x = \sin x + c$$
$$\int \frac{1}{\sin^2 x}\,\mathrm{d}x = -\operatorname{cotg} x + c$$
$$\int \frac{1}{\cos^2 x}\,\mathrm{d}x = \operatorname{tg} x + c$$
$$\int \frac{1}{1+x^2}\,\mathrm{d}x = \operatorname{arctg} x + c$$
$$\int \frac{1}{a^2+x^2}\,\mathrm{d}x = \frac{1}{a}\operatorname{arctg}\frac{x}{a} + c, \quad a \neq 0$$
$$\int \frac{1}{\sqrt{1-x^2}}\,\mathrm{d}x = \arcsin x + c$$
$$\int \frac{1}{\sqrt{a^2-x^2}}\,\mathrm{d}x = \arcsin\frac{x}{a} + c, \quad a \neq 0$$
$$\int \frac{1}{\sqrt{a+x^2}}\,\mathrm{d}x = \ln\left|x + \sqrt{x^2+a}\right| + c, \ a \neq 0$$

$$\int \frac{f'(x)}{f(x)}\,\mathrm{d}x = \ln|f(x)| + c$$
$$\int f(ax+b)\,\mathrm{d}x = \frac{1}{a}F(ax+b) + c$$

Rozklad racionální funkce na parciální zlomky

$$\frac{5x - 14}{x^3 - x^2 - 4x + 4}$$

zpět

$$\frac{5x-14}{x^3-x^2-4x+4}$$

zpět

$$x^3-x^2-4x+4$$

$$\frac{5x - 14}{x^3 - x^2 - 4x + 4}$$

zpět

$$x^3 - x^2 - 4x + 4 = x^2(x-1) - 4(x-1)$$

$$\frac{5x-14}{x^3-x^2-4x+4}$$

zpět

$$x^3-x^2-4x+4=x^2(x-1)-4(x-1)=(x-1)(x^2-4)$$

Rozklad racionální funkce na parciální zlomky

$$\frac{5x-14}{x^3-x^2-4x+4}$$

zpět

$$\begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1) = (x-1)(x^2-4) \\ &= \underline{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{x+2}$$

zpět

$\heartsuit$
$$x^3 - x^2 - 4x + 4 = x^2(x-1) - 4(x-1) = (x-1)(x^2-4)$$
$$= (x-1)(x-2)(x+2)$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$\heartsuit$
$$x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4)$$
$$= \underset{\sim\sim\sim}{(x-1)(x-2)(x+2)}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

Rozklad racionální funkce na parciální zlomky

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$\heartsuit$
$$x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4)$$
$$= \underset{\sim\sim\sim}{(x-1)(x-2)(x+2)}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$\heartsuit$
$$\begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underset{\sim\sim\sim}{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot(x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$\heartsuit$
$$\begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underset{\sim\sim\sim}{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot(x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$\boxed{x=1}$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4)$$
$$= \underline{(x-1)(x-2)(x+2)}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$$\boxed{x=1} \implies \qquad 5\cdot 1-14 = A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4)$$
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$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

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$$-9 = -3A$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4) = \underline{(x-1)(x-2)(x+2)}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot(x-1)(x-2)(x+2)$$

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$$-9 = -3A$$

$$\underline{A=3}$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad \begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underline{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$\boxed{x=1} \implies$

$$\begin{aligned} 5\cdot 1-14 &= A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0\\ -9 &= -3A\\ \underline{A} &\underline{= 3} \end{aligned}$$

$\boxed{x=2}$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4) = \underline{(x-1)(x-2)(x+2)}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$\boxed{x=1} \implies$

$$5\cdot 1-14 = A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0$$
$$-9=-3A$$
$$\underline{A=3}$$

$\boxed{x=2} \implies$

$$5\cdot 2-14 = A\cdot 0+B\cdot(2-1)(2+2)+C\cdot 0$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad \begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underline{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

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$$\boxed{x=2} \implies \begin{aligned} 5\cdot 2-14 &= A\cdot 0+B\cdot(2-1)(2+2)+C\cdot 0\\ -4 &= 4B \end{aligned}$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad x^3-x^2-4x+4 = x^2(x-1)-4(x-1) = (x-1)(x^2-4)$$
$$= \underline{(x-1)(x-2)(x+2)}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot(x-1)(x-2)(x+2)$$
$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$$\boxed{x=1} \implies \quad 5\cdot1-14 = A\cdot(1-2)(1+2)+B\cdot0+C\cdot0$$
$$-9=-3A$$
$$\underline{A=3}$$

$$\boxed{x=2} \implies \quad 5\cdot2-14 = A\cdot0+B\cdot(2-1)(2+2)+C\cdot0$$
$$-4=4B$$
$$\underline{B=-1}$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad \begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4) \\ &= \underset{\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim}{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot(x-1)(x-2)(x+2)$$

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$\boxed{x=1} \implies$

$$\begin{aligned} 5\cdot 1-14 &= A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0 \\ -9 &= -3A \\ \underset{\sim\sim\sim}{A} &\underset{\sim\sim\sim}{=3} \end{aligned}$$

$\boxed{x=2} \implies$

$$\begin{aligned} 5\cdot 2-14 &= A\cdot 0+B\cdot(2-1)(2+2)+C\cdot 0 \\ -4 &= 4B \\ \underset{\sim\sim\sim}{B} &\underset{\sim\sim\sim}{=-1} \end{aligned}$$

$\boxed{x=-2}$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$\heartsuit$
$$\begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underset{\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim}{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \quad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$\boxed{x=1} \implies$
$$\begin{aligned} 5\cdot 1-14 &= A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0\\ -9 &= -3A\\ \underset{\sim\sim\sim}{A} &\underset{\sim\sim\sim}{=3} \end{aligned}$$

$\boxed{x=2} \implies$
$$\begin{aligned} 5\cdot 2-14 &= A\cdot 0+B\cdot(2-1)(2+2)+C\cdot 0\\ -4 &= 4B\\ \underset{\sim\sim\sim}{B} &\underset{\sim\sim\sim}{=-1} \end{aligned}$$

$\boxed{x=-2} \implies 5\cdot(-2)-14 = A\cdot 0+B\cdot 0+C\cdot(-2-1)(-2-2)$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad \begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underset{\sim\sim\sim}{(x-1)(x-2)(x+2)}\end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$$\boxed{x=1} \implies \begin{aligned} 5\cdot 1-14 &= A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0\\ -9 &= -3A\\ A &= 3\end{aligned}$$

$$\boxed{x=2} \implies \begin{aligned} 5\cdot 2-14 &= A\cdot 0+B\cdot(2-1)(2+2)+C\cdot 0\\ -4 &= 4B\\ B &= -1\end{aligned}$$

$$\boxed{x=-2} \implies \begin{aligned} 5\cdot(-2)-14 &= A\cdot 0+B\cdot 0+C\cdot(-2-1)(-2-2)\\ -24 &= 12A\end{aligned}$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2}$$

zpět

$$\heartsuit \qquad \begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4) \\ &= \underset{\sim\sim\sim}{(x-1)(x-2)(x+2)} \end{aligned}$$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big| \cdot (x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

$$\boxed{x=1} \implies \begin{aligned} 5\cdot 1-14 &= A\cdot(1-2)(1+2)+B\cdot 0+C\cdot 0 \\ -9 &= -3A \\ \underset{\sim\sim\sim}{A = 3} \end{aligned}$$

$$\boxed{x=2} \implies \begin{aligned} 5\cdot 2-14 &= A\cdot 0+B\cdot(2-1)(2+2)+C\cdot 0 \\ -4 &= 4B \\ \underset{\sim\sim\sim}{B = -1} \end{aligned}$$

$$\boxed{x=-2} \implies \begin{aligned} 5\cdot(-2)-14 &= A\cdot 0+B\cdot 0+C\cdot(-2-1)(-2-2) \\ -24 &= 12A \\ \underset{\sim\sim\sim}{C = -2} \end{aligned}$$

$$\frac{5x-14}{x^3-x^2-4x+4} \overset{\heartsuit}{=} \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \overset{\clubsuit}{=} \underline{\underline{\frac{3}{x-1}-\frac{1}{x-2}-\frac{2}{x+2}}}$$

zpět

$\heartsuit$

$$\begin{aligned} x^3-x^2-4x+4 &= x^2(x-1)-4(x-1)=(x-1)(x^2-4)\\ &= \underline{(x-1)(x-2)(x+2)} \end{aligned}$$

$\clubsuit$

$$\frac{5x-14}{(x-1)(x-2)(x+2)} = \frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x+2} \qquad \Big|\cdot(x-1)(x-2)(x+2)$$

$$5x-14 = A(x-2)(x+2)+B(x-1)(x+2)+C(x-1)(x-2)$$

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$$\boxed{x=-2} \implies \begin{aligned} 5\cdot(-2)-14 &= A\cdot 0+B\cdot 0+C\cdot(-2-1)(-2-2)\\ -24 &= 12A\\ \underline{C} &\underline{= -2} \end{aligned}$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$\frac{\dfrac{x^3+1}{x^4-3x^3+3x^2-x}}{x^4-3x^3+3x^2-x}$$

zpět

zpět

$$\frac{x^3 + 1}{x^4 - 3x^3 + 3x^2 - x}$$

$$x^4 - 3x^3 + 3x^2 - x = x^4 - x - 3x^3 + 3x^2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1)$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$x^4-3x^3+3x^2-x=x^4-x-3x^3+3x^2=x(x^3-1)-3x^2(x-1)=x(x-1)(x^2+x+1)-3x^2(x-1)$$

Rozklad racionální funkce na parciální zlomky

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x]$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1]$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x}$$

zpět

$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
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$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$
$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
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$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
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$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \stackrel{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = x(x-1)^3$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \quad \Big| \cdot x(x-1)^3$$
$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0}$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0}$ $\Longrightarrow$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A \quad \Longleftrightarrow \quad \underline{A=-1}$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1}$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1} \implies$ $$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A \quad \Longleftrightarrow \quad \underline{A=-1}$$

$\boxed{x=1}$ $\Longrightarrow$ $$1^3+1 = A\cdot 0 + B_1 \cdot 0 + B_2\cdot 0 + B_3 \cdot 1 \quad \Longleftrightarrow \quad \underline{B_3 = 2}$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$
$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1}$ $\Longrightarrow$ $$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2}$

zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big|\cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1} \implies$ $$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2} \implies$ $$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1} \implies$ $$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2} \implies$ $$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$
$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1 \cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3 = 2}$$

$\boxed{x=2} \implies$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1}$ $\Longrightarrow$ $$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3 = 2}$$

$\boxed{x=2}$ $\Longrightarrow$ $$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2 \cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$
$$3 = B_1 + B_2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x}+\frac{B_1}{x-1}+\frac{B_2}{(x-1)^2}+\frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$
$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x}+\frac{B_1}{x-1}+\frac{B_2}{(x-1)^2}+\frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$
$$x^3+1 = A(x-1)^3+B_1\cdot x(x-1)^2+B_2\cdot x(x-1)+B_3\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$
$$0^3+1 = A\cdot(0-1)^3+B_1\cdot 0+B_2\cdot 0+B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1}$ $\Longrightarrow$
$$1^3+1 = A\cdot 0+B_1\cdot 0+B_2\cdot 0+B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2}$ $\Longrightarrow$
$$2^3+1 = A\cdot(2-1)^3+B_1\cdot 2(2-1)^2+B_2\cdot 2(2-1)+B_3\cdot 2$$
$$9 = -1\cdot 1+B_1\cdot 2\cdot 1+B_2\cdot 2\cdot 1+2\cdot 2$$
$$6 = 2B_1+2B_2$$
$$3 = B_1+B_2$$

$\boxed{x=-1}$

zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$

$1 = -A \iff \underline{A=-1}$

$\boxed{x=1}$ $\Longrightarrow$ $1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$

$\boxed{x=2}$ $\Longrightarrow$ $2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$

$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$

$6 = 2B_1 + 2B_2$

$3 = B_1 + B_2$

$\boxed{x=-1}$ $\Longrightarrow$ $3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$

Rozklad racionální funkce na parciální zlomky

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$
$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = x(x-1)^3$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big|\cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff A=-1$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff B_3 = 2$$

$\boxed{x=2} \implies$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$
$$3 = B_1 + B_2$$

$\boxed{x=-1} \implies$
$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$$
$$28 = -1\cdot 8 + B_1\cdot 3\cdot 4 + B_2\cdot 3\cdot 2 + 2\cdot 3$$

Rozklad racionální funkce na parciální zlomky

zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1}$ $\Longrightarrow$
$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2}$ $\Longrightarrow$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$
$$3 = B_1 + B_2$$

$\boxed{x=-1}$ $\Longrightarrow$
$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$$
$$28 = -1\cdot 8 + B_1\cdot 3\cdot 4 + B_2\cdot 3\cdot 2 + 2\cdot 3$$
$$30 = 12B_1 + 6B_2$$

zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$$\heartsuit \qquad x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = x(x-1)^3$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$
$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A \iff A = -1$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1 \cdot 0 + B_2 \cdot 0 + B_3 \cdot 1 \iff B_3 = 2$$

$\boxed{x=2} \implies$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3 \cdot 2$$
$$9 = -1\cdot 1 + B_1 \cdot 2 \cdot 1 + B_2 \cdot 2 \cdot 1 + 2 \cdot 2$$
$$6 = 2B_1 + 2B_2$$
$$3 = B_1 + B_2$$

$\boxed{x=-1} \implies$
$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3 \cdot 3$$
$$28 = -1\cdot 8 + B_1 \cdot 3 \cdot 4 + B_2 \cdot 3 \cdot 2 + 2 \cdot 3$$
$$30 = 12B_1 + 6B_2$$
$$5 = 2B_1 + B_2$$

zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = x(x-1)^3$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff A=-1$$

$\boxed{x=1}$ $\Longrightarrow$
$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff B_3 = 2$$

$\boxed{x=2}$ $\Longrightarrow$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$
$$3 = B_1 + B_2$$

$\boxed{x=-1}$ $\Longrightarrow$
$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$$
$$28 = -1\cdot 8 + B_1\cdot 3\cdot 4 + B_2\cdot 3\cdot 2 + 2\cdot 3$$
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$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big|\cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2} \implies$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$
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$\boxed{x=-1} \implies$
$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$$
$$28 = -1\cdot 8 + B_1\cdot 3\cdot 4 + B_2\cdot 3\cdot 2 + 2\cdot 3$$
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$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$
$$\begin{aligned} x^4-3x^3+3x^2-x &= x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1) \\ &= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3} \end{aligned}$$

$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

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$\boxed{x=0} \implies$
$$\begin{aligned} 0^3+1 &= A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0 \\ 1 &= -A \iff \underline{A=-1} \end{aligned}$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3 = 2}$$

$\boxed{x=2} \implies$
$$\begin{aligned} 2^3+1 &= A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2 \\ 9 &= -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2 \\ 6 &= 2B_1 + 2B_2 \\ 3 &= B_1 + B_2 \end{aligned}$$

$\boxed{x=-1} \implies$
$$\begin{aligned} 3^3+1 &= A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3 \\ 28 &= -1\cdot 8 + B_1\cdot 3\cdot 4 + B_2\cdot 3\cdot 2 + 2\cdot 3 \\ 30 &= 12B_1 + 6B_2 \\ 5 &= 2B_1 + B_2 \end{aligned}$$

$$\begin{aligned} 3 &= B_1 + B_2 \implies B_2 = 3 - B_1 \\ 5 &= 2B_1 + B_2 \end{aligned}$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

zpět

$\heartsuit$ $$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
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$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2 \cdot 0 + B_3 \cdot 0$$
$$1 = -A \iff A = -1$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1 \cdot 0 + B_2 \cdot 0 + B_3 \cdot 1 \iff B_3 = 2$$

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$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2 \cdot 2(2-1) + B_3 \cdot 2$$
$$9 = -1\cdot 1 + B_1 \cdot 2 \cdot 1 + B_2 \cdot 2 \cdot 1 + 2 \cdot 2$$
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$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2 \cdot 3(3-1) + B_3 \cdot 3$$
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zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$$\heartsuit \qquad x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
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$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3 \cdot 0$$
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$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff B_3 = 2$$

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$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
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$$5 = 2B_1 + 3 - B_1$$
$$B_1 = 2$$

Rozklad racionální funkce na parciální zlomky

zpět

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3}$$

$\heartsuit$

$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$

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$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \qquad \Big| \cdot x(x-1)^3$$

$$x^3+1 = A(x-1)^3 + B_1\cdot x(x-1)^2 + B_2\cdot x(x-1) + B_3\cdot x$$

$\boxed{x=0} \implies$

$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$

$$1 = -A \iff A=-1$$

$\boxed{x=1} \implies$

$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff B_3 = 2$$

$\boxed{x=2} \implies$

$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$

$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$

$$6 = 2B_1 + 2B_2$$

$$3 = B_1 + B_2$$

$\boxed{x=-1} \implies$

$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$$

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$$3 = B_1 + B_2 \implies B_2 = 3 - B_1$$

$$5 = 2B_1 + B_2 \qquad B_2 = 1$$

$$5 = 2B_1 + 3 - B_1$$

$$B_1 = 2$$

$$\frac{x^3+1}{x^4-3x^3+3x^2-x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \overset{\clubsuit}{=} \underline{\underline{\frac{-1}{x} + \frac{2}{x-1} + \frac{1}{(x-1)^2} + \frac{2}{(x-1)^3}}}$$

zpět

$\heartsuit$
$$x^4-3x^3+3x^2-x = x^4-x-3x^3+3x^2 = x(x^3-1)-3x^2(x-1) = x(x-1)(x^2+x+1)-3x^2(x-1)$$
$$= x(x-1)[x^2+x+1-3x] = x(x-1)[x^2-2x+1] = x(x-1)(x-1)^2 = \underline{x(x-1)^3}$$

$\clubsuit$
$$\frac{x^3+1}{x(x-1)^3} = \frac{A}{x} + \frac{B_1}{x-1} + \frac{B_2}{(x-1)^2} + \frac{B_3}{(x-1)^3} \quad \Big| \cdot x(x-1)^3$$
$$x^3+1 = A(x-1)^3 + B_1 \cdot x(x-1)^2 + B_2 \cdot x(x-1) + B_3 \cdot x$$

$\boxed{x=0} \implies$
$$0^3+1 = A\cdot(0-1)^3 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 0$$
$$1 = -A \iff \underline{A=-1}$$

$\boxed{x=1} \implies$
$$1^3+1 = A\cdot 0 + B_1\cdot 0 + B_2\cdot 0 + B_3\cdot 1 \iff \underline{B_3=2}$$

$\boxed{x=2} \implies$
$$2^3+1 = A\cdot(2-1)^3 + B_1\cdot 2(2-1)^2 + B_2\cdot 2(2-1) + B_3\cdot 2$$
$$9 = -1\cdot 1 + B_1\cdot 2\cdot 1 + B_2\cdot 2\cdot 1 + 2\cdot 2$$
$$6 = 2B_1 + 2B_2$$
$$3 = B_1 + B_2$$

$\boxed{x=-1} \implies$
$$3^3+1 = A\cdot(3-1)^3 + B_1\cdot 3(3-1)^2 + B_2\cdot 3(3-1) + B_3\cdot 3$$
$$28 = -1\cdot 8 + B_1\cdot 3\cdot 4 + B_2\cdot 3\cdot 2 + 2\cdot 3$$
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$$5 = 2B_1 + B_2 \qquad \underline{B_2 = 1}$$
$$5 = 2B_1 + 3 - B_1$$
$$\underline{B_1 = 2}$$

$$\frac{5x+2}{x^3+2x^2+10x}$$

zpět

$$\frac{5x+2}{x^3+2x^2+10x}$$

zpět

$$\overline{}$$

$$x^3+2x^2+10x$$

Rozklad racionální funkce na parciální zlomky

zpět

$$\frac{5x+2}{x^3+2x^2+10x}$$

$$x^3+2x^2+10x = x(x^2+2x+10)$$

Rozklad racionální funkce na parciální zlomky

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $$x^3+2x^2+10x = \underline{x(x^2+2x+10)}$$

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $$x^3+2x^2+10x = \underline{x(x^2+2x+10)}$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

$\heartsuit$ $$x^3+2x^2+10x = x(x^2+2x+10)$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \qquad \Big| \cdot x(x^2+2x+10)$$

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $\quad x^3+2x^2+10x = \underline{x(x^2+2x+10)}$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \qquad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit \qquad x^3+2x^2+10x = \underline{x(x^2+2x+10)}$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \quad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$\boxed{x=0}$

$$\frac{5x+2}{x^3+2x^2+10x} \stackrel{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $\quad x^3+2x^2+10x = x(x^2+2x+10)$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \qquad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$\boxed{x=0} \implies \qquad 2 = A\cdot 10 + B_1\cdot 0 + B_2\cdot 0$

zpět

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

$\heartsuit$ $$x^3+2x^2+10x = \underline{x(x^2+2x+10)}$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \quad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$

$$2 = A\cdot 10 + B_1\cdot 0 + B_2\cdot 0$$

$$\underline{A = \frac{1}{5}}$$

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $$x^3+2x^2+10x = \underline{x(x^2+2x+10)}$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \qquad \Big|\cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$

$$2 = A\cdot 10 + B_1\cdot 0 + B_2\cdot 0$$

$$\underline{A = \frac{1}{5}}$$

$\boxed{x=1}$

zpět

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

$\heartsuit$ $\quad x^3 + 2x^2 + 10x = \underline{x(x^2+2x+10)}$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \qquad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1 \cdot x(2x+2) + B_2 \cdot x$$

$\boxed{x=0}$ $\Longrightarrow$ $2 = A\cdot 10 + B_1 \cdot 0 + B_2 \cdot 0$

$\underline{A = \frac{1}{5}}$

$\boxed{x=1}$ $\Longrightarrow$ $7 = A\cdot 13 + B_1 \cdot 4 + B_2 \cdot 1$

zpět

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

$\heartsuit$ $$x^3+2x^2+10x = \underset{\sim\sim\sim}{x(x^2+2x+10)}$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \quad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

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zpět

$\heartsuit$ $$x^3+2x^2+10x = \underset{\sim\sim\sim}{x(x^2+2x+10)}$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \quad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$\boxed{x=0}$ $\Longrightarrow$

$$2 = A\cdot 10 + B_1\cdot 0 + B_2\cdot 0$$

$$A = \frac{1}{5}$$

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$$7 = A\cdot 13 + B_1\cdot 4 + B_2\cdot 1$$

$$7 = \frac{1}{5}\cdot 13 + 4B_1 + B_2$$

$$\frac{22}{5} = 4B_1 + B_2$$

$$\frac{5x+2}{x^3+2x^2+10x} \stackrel{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $$x^3+2x^2+10x = x(x^2+2x+10)$$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \quad \Big| \cdot x(x^2+2x+10)$$

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$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

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$$-3 = A\cdot 9 + B_1\cdot 0 + B_2\cdot(-1)$$

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zpět

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$$\frac{22}{5} = 4B_1 + B_2$$

$\boxed{x=-1}$ $\Longrightarrow$

$$-3 = A\cdot 9 + B_1\cdot 0 + B_2\cdot(-1)$$

$$-3 = \frac{1}{5}\cdot 9 - B_2$$

$$\frac{5x+2}{x^3+2x^2+10x} \stackrel{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

$\heartsuit$ $\quad x^3+2x^2+10x = \underline{x(x^2+2x+10)}$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \qquad \Big| \cdot x(x^2+2x+10)$$

$$5x+2 = A\cdot(x^2+2x+10) + B_1\cdot x(2x+2) + B_2\cdot x$$

$\boxed{x=0} \implies$

$$2 = A\cdot 10 + B_1\cdot 0 + B_2\cdot 0$$

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$$7 = A\cdot 13 + B_1\cdot 4 + B_2\cdot 1$$

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$$-3 = A\cdot 9 + B_1\cdot 0 + B_2\cdot(-1)$$

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$$\underline{B_2 = \frac{24}{5}}$$

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

zpět

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$$-3 = A\cdot 9 + B_1\cdot 0 + B_2\cdot(-1)$$

$$-3 = \frac{1}{5}\cdot 9 - B_2$$

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$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10}$$

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$$B_1 = -\frac{1}{10}$$

$$\frac{5x+2}{x^3+2x^2+10x} \overset{\heartsuit}{=} \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \overset{\clubsuit}{=} \underline{\underline{\frac{\frac{1}{5}}{x} - \frac{\frac{1}{10}(2x+2)}{x^2+2x+10} + \frac{\frac{24}{5}}{x^2+2x+10}}}$$

zpět

$\heartsuit$ $$x^3+2x^2+10x = \underline{x(x^2+2x+10)}$$

$\clubsuit$

$$\frac{5x+2}{x(x^2+2x+10)} = \frac{A}{x} + \frac{B_1(2x+2)}{x^2+2x+10} + \frac{B_2}{x^2+2x+10} \quad \Big| \cdot x(x^2+2x+10)$$

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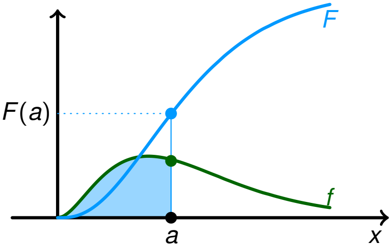
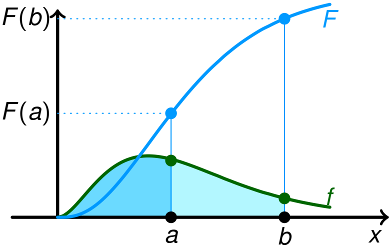
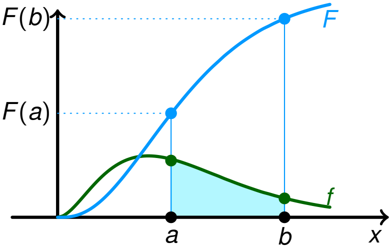


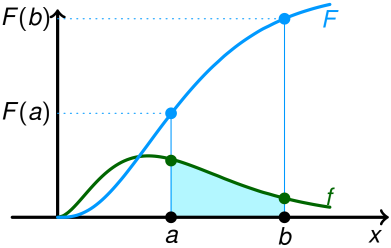
$F(a)$



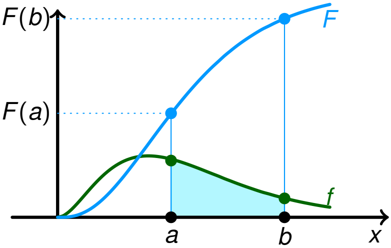
$F(b)$ $F(a)$



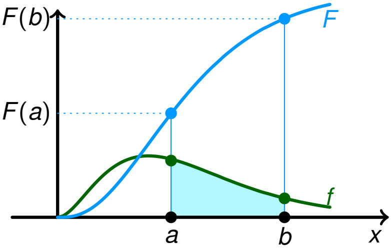
$$F(b) - F(a)$$



$$[F(x)]_a^b = F(b) - F(a)$$



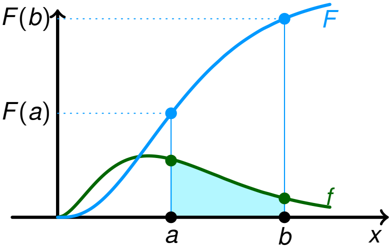
$$\int_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)$$



$$\int_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)$$

Příklad 3.1:

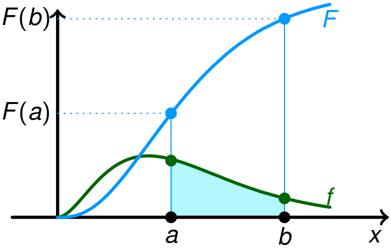
$$\int_1^2 (x^3 - 9x^2 + 18x)\,\mathrm{d}x$$



$$\boxed{\int_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)}$$

Příklad 3.1:

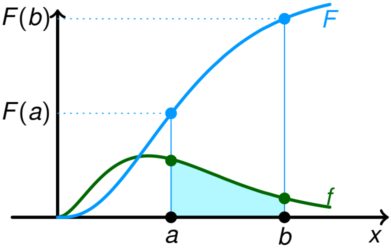
$$\int_1^2 (x^3 - 9x^2 + 18x)\,\mathrm{d}x = \frac{x^4}{4} - 9\frac{x^3}{3} + 18\frac{x^2}{2}$$



$$\boxed{\int\limits_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)}$$

Příklad 3.1:

$$\int\limits_1^2 (x^3 - 9x^2 + 18x)\,\mathrm{d}x = \left[\frac{x^4}{4} - 9\frac{x^3}{3} + 18\frac{x^2}{2}\right]_1^2$$



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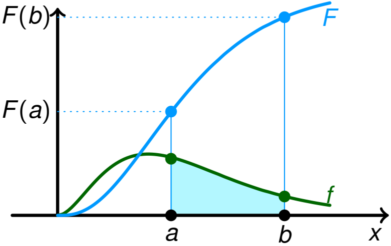
Příklad 3.1:

$$\int_1^2 (x^3 - 9x^2 + 18x)\,\mathrm{d}x = \left[\frac{x^4}{4} - 9\frac{x^3}{3} + 18\frac{x^2}{2}\right]_1^2$$

$$= \left(\frac{16}{4} - 9\cdot\frac{8}{3} + 18\cdot\frac{4}{2}\right)$$

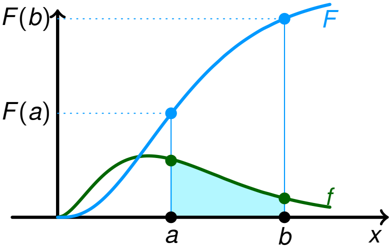


$$\boxed{\int_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)}$$

Příklad 3.1:

$$\int_1^2 (x^3 - 9x^2 + 18x)\,\mathrm{d}x = \left[\frac{x^4}{4} - 9\frac{x^3}{3} + 18\frac{x^2}{2}\right]_1^2$$

$$= \left(\frac{16}{4} - 9\cdot\frac{8}{3} + 18\cdot\frac{4}{2}\right) - \left(\frac{1}{4} - \frac{9}{3} + \frac{18}{2}\right)$$



$$\boxed{\int_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)}$$

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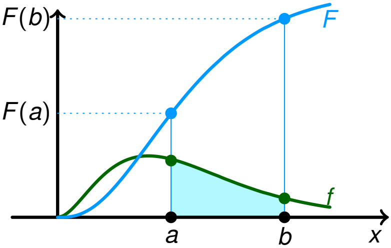
$$= \left(\frac{16}{4} - 9\cdot\frac{8}{3} + 18\cdot\frac{4}{2}\right) - \left(\frac{1}{4} - \frac{9}{3} + \frac{18}{2}\right) = 16 - \frac{47}{4}$$



$$\boxed{\int_a^b f(x)\,\mathrm{d}x = [F(x)]_a^b = F(b) - F(a)}$$

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$$\int_1^2 (x^3 - 9x^2 + 18x)\,\mathrm{d}x = \left[\frac{x^4}{4} - 9\frac{x^3}{3} + 18\frac{x^2}{2}\right]_1^2$$

$$= \left(\frac{16}{4} - 9\cdot\frac{8}{3} + 18\cdot\frac{4}{2}\right) - \left(\frac{1}{4} - \frac{9}{3} + \frac{18}{2}\right) = 16 - \frac{47}{4} = \underline{\underline{\frac{17}{4}}}$$

Příklad 3.2:

$$\int_{-1}^{1} (3x^2 - 4) \ln(x + 2) \, \mathrm{d}x$$

Příklad 3.2:

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vzorce

$$\boxed{\int_a^b u'v = [uv]_a^b - \int_a^b uv'}$$

Příklad 3.2:

$$\int_{-1}^{1} (3x^2 - 4)\ln(x+2)\,\mathrm{d}x = \begin{vmatrix} u' = 3x^2 - 4 & v = \ln(x+2) \\ u = x^3 - 4x & v' = \dfrac{1}{x+2} \end{vmatrix}$$

vzorce

$$\boxed{\int_a^b u'v = [uv]_a^b - \int_a^b uv'}$$

Příklad 3.2:

$$\int_{-1}^{1} (3x^2 - 4)\ln(x+2)\,\mathrm{d}x = \left| \begin{array}{ll} u' = 3x^2 - 4 & v = \ln(x+2) \\ u = x^3 - 4x & v' = \dfrac{1}{x+2} \end{array} \right|$$

$$= \Big[(x^3 - 4x)\ln(x+2)\Big]_{-1}^{1} - \int_{-1}^{1} \frac{x^3 - 4x}{x+2}\,\mathrm{d}x$$

vzorce

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Příklad 3.2:

$$\int_{-1}^{1} (3x^2 - 4)\ln(x+2)\,\mathrm{d}x = \left| \begin{array}{ll} u' = 3x^2 - 4 & v = \ln(x+2) \\ u = x^3 - 4x & v' = \dfrac{1}{x+2} \end{array} \right|$$

$$= \Big[(x^3 - 4x)\ln(x+2)\Big]_{-1}^{1} - \int_{-1}^{1} \frac{x^3 - 4x}{x+2}\,\mathrm{d}x = -3\ln 3 - 3\ln 1 - \int_{-1}^{1} x(x-2)\,\mathrm{d}x$$

vzorce

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Příklad 3.2:

$$\int_{-1}^{1} (3x^2 - 4)\ln(x+2)\,\mathrm{d}x = \begin{vmatrix} u' = 3x^2 - 4 & v = \ln(x+2) \\ u = x^3 - 4x & v' = \dfrac{1}{x+2} \end{vmatrix}$$

$$= \Big[(x^3 - 4x)\ln(x+2)\Big]_{-1}^{1} - \int_{-1}^{1} \frac{x^3 - 4x}{x+2}\,\mathrm{d}x = -3\ln 3 - 3\ln 1 - \int_{-1}^{1} x(x-2)\,\mathrm{d}x$$

$$= -3\ln 3 - \left[\frac{x^3}{3} - x^2\right]_{-1}^{1}$$

vzorce

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Příklad 3.2:

$$\int_{-1}^{1} (3x^2-4)\ln(x+2)\,\mathrm{d}x = \left| \begin{array}{ll} u' = 3x^2-4 & v = \ln(x+2) \\ u = x^3-4x & v' = \dfrac{1}{x+2} \end{array} \right|$$

$$= \Big[(x^3-4x)\ln(x+2)\Big]_{-1}^{1} - \int_{-1}^{1} \frac{x^3-4x}{x+2}\,\mathrm{d}x = -3\ln 3 - 3\ln 1 - \int_{-1}^{1} x(x-2)\,\mathrm{d}x$$

$$= -3\ln 3 - \left[\frac{x^3}{3} - x^2\right]_{-1}^{1} = -3\ln 3 - \left(\left(\frac{1}{3}-1\right) - \left(-\frac{1}{3}-1\right)\right)$$

vzorce

$$\boxed{\int_a^b u'v = [uv]_a^b - \int_a^b uv'}$$

Příklad 3.2:

$$\int_{-1}^{1} (3x^2 - 4)\ln(x+2)\,\mathrm{d}x = \left| \begin{array}{ll} u' = 3x^2 - 4 & v = \ln(x+2) \\ u = x^3 - 4x & v' = \dfrac{1}{x+2} \end{array} \right|$$

$$= \Big[(x^3 - 4x)\ln(x+2)\Big]_{-1}^{1} - \int_{-1}^{1} \frac{x^3 - 4x}{x+2}\,\mathrm{d}x = -3\ln 3 - 3\ln 1 - \int_{-1}^{1} x(x-2)\,\mathrm{d}x$$

$$= -3\ln 3 - \left[\frac{x^3}{3} - x^2\right]_{-1}^{1} = -3\ln 3 - \left(\left(\frac{1}{3} - 1\right) - \left(-\frac{1}{3} - 1\right)\right) = \underline{\underline{-3\ln 3 - \frac{2}{3}}}$$

vzorce

$$\boxed{\int_a^b u'v = [uv]_a^b - \int_a^b uv'}$$

Příklad 3.3: Urči obsah rovinného obrazce ohraničeného křivkami

$$x = -2, \quad x = 3, \quad y = 0, \quad y = x + 3$$

$x = -2, x = 3, y = 0, y = x + 3$

Příklad 3.3: Urči obsah rovinného obrazce ohraničeného křivkami

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vzorce

$$\boxed{S = \int_a^b |f(x)| \, \mathrm{d}x}$$

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$x = -2, x = 3, y = 0, y = x + 3 \quad \ldots f(x) = x + 3$

vzorce

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$$S = \int_{-2}^{3} |x + 3| \, \mathrm{d}x$$

vzorce

$$\boxed{S = \int_a^b |f(x)| \, \mathrm{d}x}$$

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$$S = \int_{-2}^{3} |x + 3| \, \mathrm{d}x = \int_{-2}^{3} (x + 3) \, \mathrm{d}x$$

vzorce

$$\boxed{S = \int_{a}^{b} |f(x)| \, \mathrm{d}x}$$

Příklad 3.3: Urči obsah rovinného obrazce ohraničeného křivkami

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$$S = \int_{-2}^{3} |x+3| \,\mathrm{d}x = \int_{-2}^{3} (x+3)\,\mathrm{d}x = \left[\frac{x^2}{2} + 3x\right]_{-2}^{3}$$

vzorce

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vzorce

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vzorce

$$\boxed{S = \int_a^b |f(x)| \,\mathrm{d}x}$$

Příklad 3.4:

$$y^2 = 2x, x^2 = 2y$$

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$$\boxed{S = \int_a^b |f(x) - g(x)| \, \mathrm{d}x}$$

Příklad 3.4:

$$y^2 = 2x, x^2 = 2y \quad \ldots f(x) = \sqrt{2x} \quad g(x) = \frac{x^2}{2}$$

vzorce

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$$x^4 - 8x = 0$$

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vzorce

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$$a = 0, b = 2$$

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vzorce

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vzorce

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$$y = \ln \sin x, \quad x \in \left\langle \frac{\pi}{3}, \frac{2\pi}{3} \right\rangle$$

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vzorce

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Příklad 3.5:

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$$= \int_{\frac{1}{2}}^{-\frac{1}{2}} \frac{\mathrm{d}t}{t^2-1}$$

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Příklad 3.5:

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$$= \int\limits_{\frac{1}{2}}^{-\frac{1}{2}} \frac{\mathrm{d}t}{t^2-1} = \frac{1}{2}\int\limits_{\frac{1}{2}}^{-\frac{1}{2}} \left(\frac{1}{t-1} - \frac{1}{t+1} \right) \mathrm{d}t$$

vzorce

$$\boxed{d = \int\limits_a^b \sqrt{1 + f'^2(x)}\,\mathrm{d}x}$$

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vzorce

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$$y = \ln \sin x, \quad x \in \left\langle \frac{\pi}{3}, \frac{2\pi}{3} \right\rangle \qquad \ldots f(x) = \ln \sin x$$

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

vzorce

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Příklad 3.5:

$$y = \ln\sin x, \quad x \in \left\langle \frac{\pi}{3}, \frac{2\pi}{3} \right\rangle \qquad \dots f(x) = \ln\sin x$$

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$$= \int_{\frac{1}{2}}^{-\frac{1}{2}} \frac{\mathrm{d}t}{t^2-1} = \frac{1}{2}\int_{\frac{1}{2}}^{-\frac{1}{2}} \left(\frac{1}{t-1} - \frac{1}{t+1} \right)\mathrm{d}t = \frac{1}{2}\left[\ln|t-1| - \ln|t+1| \right]_{\frac{1}{2}}^{-\frac{1}{2}}$$

$$= \frac{1}{2}\left(\left(\ln\frac{3}{2} - \ln\frac{1}{2} \right) - \left(\ln\frac{1}{2} - \ln\frac{3}{2} \right) \right) = \underline{\underline{\ln 3}}$$

vzorce

$$\boxed{d = \int_a^b \sqrt{1 + f'^2(x)}\,\mathrm{d}x}$$

Příklad 3.6:

$$\left.\begin{aligned} x(t) &= \cos t + t\sin t \\ y(t) &= \sin t - t\cos t \end{aligned}\right\} \quad t \in \langle 0, 2\pi \rangle$$

Příklad 3.6:

$$\left.\begin{aligned} x(t) &= \cos t + t\sin t \\ y(t) &= \sin t - t\cos t \end{aligned}\right\} \quad t \in \langle 0, 2\pi \rangle$$

vzorce

$$\boxed{d = \int\limits_{\alpha}^{\beta} \sqrt{(x'(t))^2 + (y'(t))^2}\,\mathrm{d}t}$$

Příklad 3.6:

$$\left.\begin{aligned} x(t) &= \cos t + t \sin t \\ y(t) &= \sin t - t \cos t \end{aligned}\right\} \; t \in \langle 0, 2\pi \rangle \qquad \ldots x'(t) = t \cos t$$

vzorce

$$\boxed{d = \int_{\alpha}^{\beta} \sqrt{(x'(t))^2 + (y'(t))^2}\,\mathrm{d}t}$$

Příklad 3.6:

$$\left.\begin{aligned} x(t) &= \cos t + t\sin t \\ y(t) &= \sin t - t\cos t \end{aligned}\right\} \; t \in \langle 0, 2\pi\rangle \qquad \ldots \begin{aligned} x'(t) &= t\cos t \\ y'(t) &= t\sin t \end{aligned}$$

vzorce

$$\boxed{d = \int_{\alpha}^{\beta} \sqrt{(x'(t))^2 + (y'(t))^2}\,\mathrm{d}t}$$

Příklad 3.6:

$$\left.\begin{aligned} x(t) &= \cos t + t \sin t \\ y(t) &= \sin t - t \cos t \end{aligned}\right\} t \in \langle 0, 2\pi \rangle \qquad \ldots x'(t) = t \cos t$$

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$$x = 1, x = 4, y = 0, xy = 4$$

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vzorce

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Urči objem tělesa vytvořeného rotací (kolem osy x) rovinného obrazce ohraničeného zadanými křivkami

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$$V = \pi \int_0^2 \left| 2x - \frac{x^4}{4} \right| \mathrm{d}x = \pi \int_0^2 \left(2x - \frac{x^4}{4} \right) \mathrm{d}x = \pi \left[x^2 - \frac{x^5}{20} \right]_0^2$$

vzorce

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vzorce

$$\boxed{V = \pi \int_a^b \left| f^2(x) - g^2(x) \right| \mathrm{d}x}$$

Příklad 3.9:

$$y = \frac{x^3}{3}, \quad x \in \langle 0, 2 \rangle$$

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$$P = 2\pi \int_0^2 \left| \frac{x^3}{3} \right| \sqrt{1 + x^4}\,\mathrm{d}x$$

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$$x \in \langle 0, 2 \rangle \implies \frac{x^3}{3} \geq 0$$

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$$= \frac{2}{12}\pi \left[\frac{2}{3} t^{\frac{3}{2}} \right]_1^{17} = \frac{1}{9}\pi(\sqrt{17^3} - 1)$$

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$$= \frac{2}{12}\pi \left[\frac{2}{3} t^{\frac{3}{2}} \right]_1^{17} = \frac{1}{9}\pi(\sqrt{17^3} - 1) = \underline{\underline{\frac{\pi}{9}(17\sqrt{17} - 1)}}$$

vzorce

$$\boxed{P = 2\pi \int_a^b |f(x)| \sqrt{1 + (f'(x))^2}\,\mathrm{d}x}$$

Příklad 3.10:

$$\left.\begin{aligned} x(t) &= t^2 \\ y(t) &= \frac{t}{3}(t^2 - 3) \end{aligned}\right\} t \in \left\langle 0, \sqrt{3} \right\rangle$$

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$$y'(t) = t^2 - 1 \qquad \frac{t}{3}(t-\sqrt{3})(t+\sqrt{3}) = 0$$

vzorce

$$\boxed{P = 2\pi \int_{\alpha}^{\beta} |x(t)| \sqrt{(x'(t))^2 + (y'(t))^2}\, \mathrm{d}t}$$

Příklad 3.10:

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vzorce

$$\boxed{P = 2\pi \int_\alpha^\beta |x(t)| \sqrt{(x'(t))^2 + (y'(t))^2}\,\mathrm{d}t}$$

Konec

(Referát)