Funkce	Derivace	Primitivní funkce
$f(x)$	$f'(x)$	$\int f(x)$
x^n	$n \cdot x^{n-1}$ $(n \neq 0)$	$\frac{1}{n+1} x^{n+1}$ $(n \neq -1)$
$\frac{1}{x}$ $(x \neq 0)$	$-\frac{1}{x^2}$	$\ln\lvert x\rvert$
e^x	e^x	e^x
$\sin x$	$\cos x$	$-\cos x$
$\cos x$	$-\sin x$	$\sin x$
$\ln x$	$\frac{1}{x}$	$x \cdot \ln x - x$
$tg\ x$	$\frac{1}{\cos^2 x}$	
$arctg\ x$	$\frac{1}{1+x^2}$	

interval není celistvý →

Spočítejte integrál:

a) $\int (x^2 + 2x)\, dx$

b) $\int (x+2)^2\, dx$

c) $\int e^x - e^{-x}\, dx$

d) $\int \sin x - \cos x\, dx$

e) $\int \frac{1+x}{\sqrt{x}}\, dx$

f) $\int \tan^2 x\, dx$

g) $\int x \cdot e^{-x^2}\, dx$

$f(g(x)) = (f'(g(x)) \cdot g'(x))\, dx$

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a) $\frac{x^3}{3} + x^2 + C$

$\int \underbrace{(x+2)}_{t}{}^2 \cdot \underbrace{1\, dx}_{dt}$

$f(g(x)) = (f'(g(x)) \cdot g'(x))\, dx$

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

$t = x+2$
$dt = dx$ $= \int t^2\, dt = \frac{t^3}{3} = \frac{(x+2)^3}{3} + C$

c) $\int e^x dx + \int e^{\underset{-1}{-x}} dx = e^x + e^{-x} + C$

d) $\left(\int \sin x - \int \cos x\right) dx = -\cos x - \sin x + C$

e) $\int \frac{1+x}{x^{\frac{1}{2}}}\, dx = \int \left(x^{-\frac{1}{2}} + x^{\frac{1}{2}}\right) dx = \int x^{-\frac{1}{2}} dx + \int x^{\frac{1}{2}} dx = 2 \cdot x^{\frac{1}{2}} + \frac{2}{3} x^{\frac{3}{2}} + C$

f) $\int \frac{\sin^2 x}{\cos^2 x}\, dx = \int \frac{1 - \cos^2 x}{\cos^2 x}\, dx = \int \frac{1}{\cos^2 x} - 1\, dx = tg\ x - x + C$

g) $-\frac{1}{2} \int e^{-x^2} \cdot (-2x)\, dx = -\frac{1}{2} \cdot e^{-x^2} + C$

$\boxed{\begin{aligned} t &= -x^2 \\ dt &= -2x\,dx \end{aligned}}$ $= \int e^t \cdot \frac{\overset{dt}{\boxed{2x\,dx}}}{-2} = -\frac{1}{2} \int e^t\, dt = \frac{1}{2} e^{-x^2} + C$

Spočítejte integrál:

a) $\int tg\, x \, dx$

b) $\int \sin^2 x \, dx$

c) $\int \cos^2 x \, dx$

Derivace per partes:

Spočítejte integrály:

a) $\int x \cdot e^x \, dx$

b) $\int x \cdot \sin x \, dx$

Opakování: Spočítejte integrál:

$$\int x \cdot e^{-x^2} dx =$$

$t = -x^2$

$dt = -2x\,dx$

$\cos x = t$

a) $\int \frac{\sin x}{\cos x} dx = -\int \frac{1}{\cos x} \cdot (-\sin x) \cdot dx = -\ln|\cos x| + c$

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$t = \cos x$

$dt = -\sin x \, dx$

$$-\int \frac{-\sin x}{\cos x} dx = -\int \frac{1}{t} dt = -\ln|t| = -\ln|\cos x| + c$$

b) $\left.\begin{array}{l} \sin^2 x + \cos^2 x = 1 \\ \cos^2 x - \sin^2 x = \cos 2x \end{array}\right\} \sin^2 x = \frac{1}{2}(1 - \cos 2x)$

$$\frac{1}{2}\int 1 - \cos 2x \, dx = \frac{1}{2}(x - \sin x \cos x) + c$$

$$\int \cos 2x \, dx = \frac{1}{2}\sin 2x = \sin x \cos x$$

$t = 2x$

$dt = 2dx$

$$f(x) \cdot g(x) = \int f(x) \cdot g'(x) dx + \int f'(x) g(x) dx$$

$$\int f(x) \cdot g'(x) dx = f(x) \cdot g(x) - \int f'(x) g(x) dx$$

$f \quad g'$

$f = x \quad g' = e^x$

$f' = 1 \quad g = e^x$

a) $\int x \cdot e^x dx = x \cdot e^x - \int 1 \cdot e^x dx = x \cdot e^x - e^x + C$

$f \quad g'$

$f = x \quad g' = \sin x$

$f' = 1 \quad g = -\cos x$

b) $\int x \cdot \sin x \, dx = -x \cdot \cos x - \int 1 \cdot (-\cos x) dx = -x\cos x + \sin x + C$

$$\int \ln x \, dx = \int \ln x \cdot 1 \, dx$$

$f \ \ln x \quad f' = \frac{1}{x}$

$g = x \quad g' = 1$