Funktionen – Integralrechnen mit der Substitutionsmethode

Lösungsblatt 1

Berechnen Sie die <u>unbestimmten Integrale</u> mit Hilfe der <u>Substitutionsmethode</u>!

$\int (4x+5)^3 . dx =$ *Substitution* $\to$ $(4x+5) = z$ $\to$ $z` = 4$

$$\to z` = \frac{dz}{dx} = 4 \quad \to dx = \frac{dz}{4}$$

$$= \int z^3 . \frac{dz}{4} = \frac{1}{4} . z^4 . \frac{1}{4} + c = \frac{1}{16} . z^4 + c = \mathbf{\frac{1}{16} . (4x+5)^4 + c}$$

$\int \frac{2x}{\sqrt{x^2-4}} . dx =$ *Substitution* $\to$ $(x^2-4) = z$ $\to$ $z` = 2x$

$$\to z` = \frac{dz}{dx} = 2x \quad \to dx = \frac{dz}{2x}$$

$$= \int \frac{2x}{\sqrt{z}} . \frac{dz}{2x} = \int \frac{1}{\sqrt{z}} . dz = \int z^{-\frac{1}{2}} . dz$$

$$= 2 . z^{\frac{1}{2}} + c = 2 . \sqrt{z} + c = \mathbf{2 . \sqrt{x^2-4} + c}$$

$\int \sqrt{6x-5} . dx =$ *Substitution* $\to$ $(6x-5) = z$ $\to$ $z` = 6$

$$\to z` = \frac{dz}{dx} = 6 \quad \to dx = \frac{dz}{6}$$

$$= \int \sqrt{z} . \frac{dz}{6} = \int z^{\frac{1}{2}} . \frac{dz}{6} = \frac{2}{3} . z^{\frac{3}{2}} . \frac{1}{6} + c = \frac{2}{18} . \sqrt{z^3} + c = \mathbf{\frac{1}{9} . z . \sqrt{z} + c}$$

$\int (5x^2-2)^4 . dx =$ *Substitution* $\to$ $(5x^2-2) = z$ $\to$ $z` = 10$

$$\to z` = \frac{dz}{dx} = 10 \quad \to dx = \frac{dz}{10}$$

$$= \int z^4 . \frac{dz}{10} = \frac{1}{5} . z^5 . \frac{1}{10} + c = \frac{1}{50} . z^5 + c = \mathbf{\frac{1}{50} . (5x^2-2)^5 + c}$$