

Calculus I

$$\int x \sqrt{ax^2 + b} dx$$

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2019

Example (Substitution Rule)

Find $\int \frac{x}{\sqrt{3-4x^2}} dx.$

Let $u = 3 - 4x^2.$

Then $du = -8x dx$

$$x dx = -\frac{1}{8} du.$$

Substitute:
$$\begin{aligned} \int \frac{x}{\sqrt{3-4x^2}} dx &= \int \left(-\frac{1}{8}\right) \frac{1}{\sqrt{u}} du \\ &= -\frac{1}{8} \cdot \frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C \\ &= -\frac{1}{4} \sqrt{3-4x^2} + C. \end{aligned}$$