Integriere mit einem geeigneten Verfahren:

$$\int_0^{\pi} x\sin(x) = -x\cos(x)\,|_0^{\pi} - \int_0^{\pi} -\cos(x)\,dx = -(-\pi - 0) + \sin(x)\,|_0^{\pi} = \pi$$

(partielle Integration)

$\int_0^5 3ae^{3x}dx$ (Substitution)

u=3x $\frac{du}{dx} = 3 \Longrightarrow dx = \frac{du}{3}$

untere Grenze = 3*0 = 0

obere Grenze = 3*5 = 15

$$\int_0^5 3ae^{3x}dx = \int_0^{15} ae^u du = a\left(e^u|_0^{15}\right) = a(e^{15} - e^0) = a(e^{15} - 1)$$

$\int x\cos(2x)\,dx$ (Substitution + partielle Integration)

u=2x $\frac{du}{dx} = 2 \Longrightarrow dx = \frac{du}{2}$

$$\int x\cos(2x)\,dx = \frac{1}{4}\int u\cos(u)\,du = \frac{1}{4}\left[u\sin(u) - \int \sin(u)\,du + c\right]$$
$$= \frac{1}{4}[u\sin(u) + \cos(u) + c] = \frac{1}{2}x\,sin(2x) + \frac{1}{4}\cos(2x) + c$$

$\int \frac{3a}{x}dx = 3a\ln(x) + c$ (Grundintegral)

$\int_0^1 e^{3a}dx = e^{3a}[x|_0^1] = e^{3a}(1-0) = e^{3a}$ $e^{3a}\ ist\ eine\ Konstante$