Berechne mit Hilfe der partiellen Integration:

$$\int xe^x \, dx = xe^x - \int e^x \, dx = (x-1)e^x + c$$

$$\int x\sin(x)\, dx = -x\cos(x) - \int -\cos(x)\, dx = -x\cos(x) + \sin(x) + c$$

$$\int_0^1 3x\, e^x \, dx = 3x\, e^x \,|_0^1 - \int_0^1 3e^x \, dx = 3e - 0 - (3e^x)|_0^1 = 3e - 3e + 3e^0$$
$$= 3$$

$$\int_\pi^{2\pi} 2x\cos(x)\, dx$$
$$= (2x\sin(x))|_\pi^{2\pi}$$
$$- \int_\pi^{2\pi} 2\sin(x)\, dx = 0 - (-2\cos(x))|_\pi^{2\pi} = -(-2-2) = 4$$

$$\int x^2 e^x \, dx = x^2 e^x - \int 2xe^x \, dx = x^2 e^x - \left(2xe^x - \int 2e^x dx\right)$$
$$= (x^2 - 2x + 2)e^x$$

Die partielle Integration wird 2x durchgeführt!

$$\int_0^\pi ax^2\sin(x)\, dx = a\left[-x^2\cos(x)|_0^\pi - \int_0^\pi -2xcos(x)\, dx\right]$$
$$= a\left[(\pi)^2 + 0 + 2\left(x\sin(x)\,|_0^\pi - \int_0^\pi \sin(x)\, dx\right)\right]$$
$$= a[(\pi)^2 + 0 + 2\cos(x)\,|_0^\pi]$$
$$= a[(\pi)^2 + (-2-2)] = a(\pi^2 - 4)$$