1 Einführung

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Bestimmen Sie jeweils alle Stammfunktionen

$$f_1(x) = \frac{2x^3}{3} - \frac{x}{2} + 1 - \frac{3}{2x} + \frac{4}{3x^2}$$
$$F_1(x) = \frac{2x^3}{9} - \frac{x^2}{4} + x - \frac{3}{2} \cdot \ln(2x) - \frac{4}{3x} + c$$

$$f_2(x) = sin(x) - 2cos(2x) + 3sin(3x) - 4cos(4x)$$
$$F_2(x) = -cos(x) - sin(2x) - cos(3x) - sin(4x) + c$$

$$f_3(x) = (1-2x)^2 + (1-2x)^1 + (1-2x)^0 + (1-2x)^{-1} + (1-2x)^{-2}$$
$$F_3(x) = -\frac{1}{6} \cdot (1-2x)^3 - \frac{1}{4} \cdot (1-2x)^2 + x - \frac{1}{2} \cdot \ln(1-2x) + \frac{1}{2} \cdot (1-2x)^{-1} + c$$

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Bestimmen Sie die Integrale

$$I_1 = \int_0^{\pi/2} cos(x)\mathrm{d}x = sin(x)\Big|_0^{\pi/2} = sin(\pi/2) - sin(0) = 1 - 0 = 1$$

$$I_2 = \int_0^{\pi} cos(x)\mathrm{d}x = sin(x)\Big|_0^{\pi} = sin(\pi) - sin(0) = 0 - 0 = 0$$

$$I_3 = \int_0^{\pi} sin(2x)\mathrm{d}x = -\frac{1}{2}cos(2x)\Big|_0^{\pi} = -\frac{1}{2}\left(cos(2\pi) - cos(0)\right) = -\frac{1}{2}(1-1) = 0$$

$$I_4 = \int_1^2 (1-x)^2\mathrm{d}x = -\frac{1}{3}(1-x)^3\Big|_1^2 = -\frac{1}{3}\left((1-2)^3 - (1-1)^3\right) = -\frac{1}{3}(-1) = \frac{1}{3}$$

$$I_5 = \int_1^{\mathrm{e}} \frac{1}{x}\mathrm{d}x = \ln(x)\Big|_1^{\mathrm{e}} = \ln(e) - ln(1) = 1 - 0 = 1$$

$$I_6 = \int_{-\mathrm{e}^2}^{-\frac{1}{\mathrm{e}}} \frac{1}{x}\mathrm{d}x = -\int_{\frac{1}{\mathrm{e}}}^{\mathrm{e}^2} \frac{1}{x}\mathrm{d}x = -\ln(x)\Big|_{\frac{1}{\mathrm{e}}}^{\mathrm{e}^2} = -\left(ln(e^2) - ln(\frac{1}{\mathrm{e}})\right) = -(2-(-1)) = -3$$