

Mudança de variável na integral definida (T4)

Exercício: Calcule

$$a) \int_1^2 (x-2)^5 dx = \int_{-1}^0 u^5 du = \frac{u^6}{6} \Big|_{-1}^0 = \frac{0^6}{6} - \frac{(-1)^6}{6} = -\frac{1}{6}$$

$x-2 = u$
 $1 dx = 1 du$

Outra solução: $\int_1^2 (x-2)^5 dx = F(2) - F(1) = \frac{(2-2)^6}{6} - \frac{(1-2)^6}{6} = -\frac{1}{6}$

$$\int (x-2)^5 dx = \int u^5 du = \frac{u^6}{6} + k = \frac{(x-2)^6}{6} + k$$

$x-2 = u$
 $dx = du$

$$b) \int_0^1 \sqrt{3x+1} dx = \int_1^4 \sqrt{u} \cdot \frac{1}{3} du = \frac{1}{3} \int_1^4 \sqrt{u} du = \frac{1}{3} \cdot \frac{2}{3} \sqrt{u^3} \Big|_1^4 = \frac{2}{9} [\sqrt{4^3} - 1]$$

$3x+1 = u$
 $3 dx = du$
 $dx = \frac{1}{3} du$

$$\int \sqrt{u} du = \int u^{\frac{1}{2}} du = \frac{u^{\frac{3}{2}}}{\frac{3}{2}} + k$$

$$c) \int_0^2 e^{2x} dx = \int_0^4 e^u \cdot \frac{1}{2} du = \frac{1}{2} e^u \Big|_0^4 = \frac{1}{2} [e^4 - 1]$$

$2x = u$
 $2 dx = du$

$$d) \int_0^1 x e^{x^2} dx = \int_0^1 e^u \cdot \frac{1}{2} du = \frac{1}{2} e^u \Big|_0^1 = \frac{1}{2} [e^1 - 1]$$

$u = x^2$
 $du = 2x dx$