

Solutions

2.1 An antiderivative is $(x-1)e^x$. At 1 and 0 it gives 0 and -1, so the integral is 1.

2.2 Substitution $w=x^2+1$ gives $dw=2x \, dx$, so the coefficient of $\ln(x^2+1)$ is 1.

2.3 $V/\pi = \text{integral } x^2 \, dx \text{ from } 0 \text{ to } 3 = [x^3/3] = 9$.

2.4 False. Choosing u and v prime well matters: the remaining integral should become simpler. In a definite substitution, either change the limits or return to x before applying the original limits.

2.5 A An integration method based on the derivative of a product.

3.1 Take $u=\ln x$, $dv=x \, dx$: antiderivative $(x^2/2)\ln x - x^2/4$. Bounds give $(e^2+1)/4$. Differentiation returns $x \ln x$; domain $x>0$ matters.