

Definite integral problems – Solutions

Compute the integrals.

1. $\int_0^3 40 - 2t^2 dt$

Solution: We get

$$\begin{aligned}\int_0^3 40 - 2t^2 dt &= \left[40t - \frac{2t^3}{3} \right]_0^3 \\ &= 120 - 18 \\ &= 102\end{aligned}$$

2. $\int_0^1 6e^{2x} dx$

Solution: Since we know $\frac{d}{dx}e^{2x} = 2e^{2x}$, we guess that $3e^{2x}$ might be an antiderivative of $6e^{2x}$. We check that

$$\begin{aligned}\frac{d}{dx}3e^{2x} &= 3 \times 2e^{2x} \\ &= 6e^{2x},\end{aligned}$$

so we were right. We get

$$\begin{aligned}\int 6e^{2x} dx &= \left[3e^{2x} \right]_0^1 \\ &= 3e^2 - 3\end{aligned}$$

3. $\int_2^4 \frac{x^3 + 2x}{x^2} dx$.

Solution: We have

$$\begin{aligned}\int_2^4 \frac{x^3 + 2x}{x^2} dx &= \int_2^4 x + \frac{2}{x} dx \\ &= \left[\frac{x^2}{2} + 2 \ln x \right]_2^4 \\ &= (8 + 2 \ln 4) - (2 + 2 \ln 2) \\ &= 6 + 2(\ln 4 - \ln 2) \\ &= 6 + 2 \ln 2\end{aligned}$$