

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. $\int 6e^{2x} \, dx$

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

$$\int 6e^{2x} \, dx = 3e^{2x} + C.$$

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

Solution: We have

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