

Question 2

Use $u = x + 2$ to evaluate:

$$\int x\sqrt{x+2} \, dx.$$

Question 2 – Solution

Step 1: Substitute $u = x + 2$. Then

$$x = u - 2, \quad du = dx.$$

Step 2: Rewrite and expand the integrand.

$$\begin{aligned} \int x\sqrt{x+2} \, dx &= \int (u-2)u^{1/2} \, du \\ &= \int (u^{3/2} - 2u^{1/2}) \, du. \end{aligned}$$

Step 3: Integrate each power.

$$\begin{aligned} I &= \frac{u^{5/2}}{5/2} - 2\frac{u^{3/2}}{3/2} + C \\ &= \frac{2}{5}u^{5/2} - \frac{4}{3}u^{3/2} + C. \end{aligned}$$

Step 4: Substitute $u = x + 2$.

$$\boxed{\frac{2}{5}(x+2)^{5/2} - \frac{4}{3}(x+2)^{3/2} + C}$$