QUIZ 1

Name: UIN:

Evaluate the integral:

$$I_1 = \int \frac{3\,x^2 + e^x}{x^3 + e^x}\,dx \tag{1}$$

Solution: set $u = x^3 + e^x$, then $du = (3x^2 + e^x)\,dx$, and using the substitution rule, the integral becomes

$$\begin{aligned} I_1 &= \int \frac{1}{u}\,du \\ &= \ln|u| + c \\ &= \ln|x^3 + e^x| + c \end{aligned}$$

Similarly, for

$$I_1 = \int \frac{2\,x + e^x}{x^2 + e^x}\,dx,$$

we would set $u = x^2 + e^x$, which implies that $du = (2x + e^x)\,dx$. So, it follows that

$$\begin{aligned} I_1 &= \int \frac{1}{u}\,du \\ &= \ln|u| + c \\ &= \ln|x^2 + e^x| + c \end{aligned}$$

Evaluate the integral:

$$I_2 = \int x\,(x+2)^{\frac{1}{3}}\,dx \tag{2}$$

Solution: set $u = x$, $dv = (x+2)^{\frac{1}{3}}\,dx$, then $du = dx$, $v = \frac{3}{4}(x+2)^{\frac{4}{3}}$. Using integration by parts we obtain

$$\begin{aligned} I_2 &= \frac{3}{4}\,x\,(x+2)^{\frac{4}{3}} - \int \frac{3}{4}(x+2)^{\frac{4}{3}}\,dx \\ &= \frac{3}{4}\,x\,(x+2)^{\frac{4}{3}} - \frac{9}{28}\,(x+2)^{\frac{7}{3}} + c \end{aligned}$$

Similarly, for

$$I_2 = \int x\,(x+2)^{\frac{1}{4}}\,dx$$

we set $u = x$, $dv = (x+2)^{\frac{1}{4}}\,dx$. Then, $du = dx$ and $v = \frac{4}{5}(x+2)^{\frac{5}{4}}$. It follows that

$$\begin{aligned} I_2 &= \frac{4}{5}\,x\,(x+2)^{\frac{5}{4}} - \int \frac{4}{5}(x+2)^{\frac{5}{4}}\,dx \\ &= \frac{4}{5}\,x\,(x+2)^{\frac{5}{4}} - \frac{16}{45}\,(x+2)^{\frac{9}{4}} + c \end{aligned}$$