

$$\begin{aligned}
 1) \int (3e^x + 5\cos x + \frac{1}{x}) &= 3 \int e^x dx + 5 \int \cos x dx + \int \frac{1}{x} dx \\
 &= 3e^x + 5\sin x + \ln|x| + c
 \end{aligned}$$

$$2) \int \frac{t^3 + 2t^2}{\sqrt{t}} dt$$

$$\begin{aligned}
 \frac{t^3 + 2t^2}{\sqrt{t}} &= \frac{t^3}{t^{1/2}} + \frac{2t^2}{t^{1/2}} \\
 &= t^{5/2} + 2t^{3/2}
 \end{aligned}$$

$$= \int (t^{5/2} + 2t^{3/2}) dt$$

$$= \frac{t^{7/2}}{\frac{7}{2}} + \frac{2t^{5/2}}{\frac{5}{2}} + C$$

$$= \frac{2}{7} t^{5/2} + 2 \cdot \frac{2}{5} t^{5/2} + C = \frac{2}{7} t^{5/2} + \frac{4}{5} t^{5/2} + C$$

$$3) \int e^x \sin(e^x) dx$$

$$= \int e^x \sin(u) \frac{du}{e^x}$$

$$= \int \sin(u) du = -\cos u + C$$

$$= -\cos(e^x) + C$$

$$\begin{aligned}
 \text{Let } u &= e^x \\
 du &= e^x dx \\
 dx &= \frac{du}{e^x}
 \end{aligned}$$

$$4) \int \frac{1}{x(\ln x)^2} dx$$

$$= \int \frac{1}{x u^2} x du$$

$$= \int \frac{1}{u^2} du = \int u^{-2} du = \frac{u^{-1}}{-1} + c = -\frac{1}{u} + c$$

$$= -\frac{1}{\ln x} + c$$

$$\text{LET } u = \ln x$$

$$du = \frac{1}{x} dx$$

$$dx = x du$$

$$5) \int \cos x \cdot \cos(\sin x) dx$$

$$= \int \cos x \cdot \cos u \frac{du}{\cos x}$$

$$= \int \cos u du = \sin u + c = \sin(\sin x) + c$$

$$\text{LET } u = \sin x$$

$$du = \cos x dx$$

$$dx = \frac{du}{\cos x}$$