1. Q — $\int (x-1)\sin(\pi x)dx$

A —

Let $u = (x-1); v' = \sin(\pi x)$. Therefore $v = -\frac{1}{\pi}\cos(\pi x)$

According to integration by parts:

$$\int uv' = uv - \int vu'$$

Therefore $\int (x-1)\sin(\pi x)dx = \frac{1-x}{\pi}\cos(\pi x) - \int -\frac{1}{\pi}\cos(\pi x)dx$

$= \frac{1-x}{\pi}\cos(\pi x) + \frac{1}{\pi}\int \cos(\pi x)dx$

$= \frac{1-x}{\pi}\cos(\pi x) + \frac{1}{\pi^2}\sin(\pi x) + C$