1. Evaluate the following integrals using integration by parts, and *check your answers!!*

   (a) $\int x \ln(x)\, dx$

   (b) $\int x^3 e^{x^2}\, dx$ (Hint: $u = x^2$ and $dv = xe^{x^2} dx$)

   (c) $\int \ln(x)\, dx$ (Hint: $u = \ln(x)$ and $dv = dx$)

   (d) $\int e^x \cos(x)\, dx$

2. Find the volume when the region bounded by $y = \sin(x)$ and the x-axis for $0 \leq x \leq \pi$ is rotated about the y-axis.