Q3
Using properties of integrals:

$$\int_{-\infty}^{0} x^2 e^x \, dx = -\int_{0}^{-\infty} x^2 e^x \, dx$$
$$= -\lim_{b \to -\infty} \left[\int_0^b x^2 e^x \, dx \right]$$

Integrating by parts, we assign

$$u = x^2, \quad du = x^2 \, dx, \quad dv = e^x \, dx, \quad v = e^x$$

$$\int x^2 e^x \, dx = x^2 e^x - \int e^x 2x \, dx$$

Integrating by parts once again, we assign

$$u = 2x, \quad du = 2 \, dx, \quad dv = e^x \, dx, \quad v = e^x$$

$$\int 2x e^x \, dx = x^2 e^x - 2 \int e^x \, dx = 2xe^x - 2e^x$$

So the improper integral evaluates to:

$$-\lim_{b \to -\infty} \left[e^x \left(x^2 - 2x - 2 \right) \right]$$

Which is clearly minus infinity, and so the integral diverges.