Problem 1) The change of variable $y = x^3$ yields $dy = 3x^2 dx = 3y^{2/3} dx \rightarrow dx = \tfrac{1}{3}y^{-2/3} dy$.

Consequently, $\int_0^\infty \exp(-x^3)\, dx = \tfrac{1}{3}\int_0^\infty y^{(1/3 - 1)}\exp(-y)\, dy = \tfrac{1}{3}\Gamma(\tfrac{1}{3})$.