1. Consider the following wavefunctions:

$$\psi_1(x) = Ae^{\frac{-y^2}{4}} \tag{1}$$

$$\psi_2(x) = Aye^{\frac{-y^2}{8}} \tag{2}$$

and

$$\psi_3(x) = A\left(e^{\frac{-y^2}{4}} + ye^{\frac{-y^2}{8}}\right) \tag{3}$$

1. Normalize all three states over the interval $-\infty < y < \infty$
2. What is the probability of finding the particle in the region $0 < y < 1$ for all three states.
3. Is the probability of finding the particle in the region $-1 < y < 1$ when it is in state ψ_3 the same as the sum of the probabilities when the particle is in states ψ_1 and ψ_2