Please show your work!

1) Evaluate the integral by \( \int_{0}^{\frac{\sqrt{2}}{2}} x \sec^2(x^2) \, dx \).

2) Find the area enclosed by the curves \( y = x^2 + 1, \ y = 3 - x^2, \ x = -1 \) and \( x = 2 \).

3) The base of a solid \( S \) is the region enclosed by the curves \( y = x^2, \ y = 0 \) and \( x = 1 \). If the cross sections of \( S \) perpendicular to the x-axis are squares, then find the volume of \( S \).