1. (5 points) Sketch the region enclosed by the curves \( x = |y| \) and \( x = 6 - y^2 \), and compute its area.

\[
6 - y^2 = y \implies y^2 + y - 6 = 0 \implies y = 2 \text{ or } -3
\]

\[
\int_{-2}^{2} (6 - y^2 - 1y) \, dy
\]

\[
= 2 \int_{0}^{2} 6 - y^2 - y \, dy
\]

\[
= 2 \left[ -\frac{1}{3} y^3 - \frac{1}{2} y^2 + 6y \right]_{0}^{2}
\]

\[
= 2 \left[ -\frac{8}{3} - 2 + 12 \right]
\]

\[
= \frac{4\pi}{3} \leftarrow 1 \text{分}
\]

Sketch 1分

2. (5 points) Find the volume of the solid whose base is the region \( |x| + |y| \leq 1 \) and whose vertical cross sections perpendicular to the y-axis are semicircles (with diameter along the base).

\[
\int_{0}^{1} \frac{1}{2} \pi r^2 \, dy
\]

\[
= 2 \int_{0}^{1} \frac{1}{2} \pi (1-y)^2 \, dy
\]

\[
= \pi \left[ -\frac{1}{3} (1-y)^3 \right]_{0}^{1}
\]

\[
= \frac{\pi}{3} \leftarrow 2 \text{分}
\]