15.2, number 49: **Sketch the region of integration for**

$$\int_0^1 \int_{-\sqrt{1-y^2}}^{\sqrt{1-y^2}} 3y \, dx \, dy.$$

**Set up the integral over the same region, with the order of integration reversed.**

Answer: The given integral is taken over the region defined as follows: for each fixed y with $0 \le y \le 1$, x goes from $x = -\sqrt{1 - y^2}$ to $x = +\sqrt{1 - y^2}$. We draw this on the next page. Keep in mind that $x = -\sqrt{1 - y^2}$ is the left half of the circle $x^2 + y^2 = 1$ and $x = +\sqrt{1 - y^2}$ is the right half of the same circle. Please look at the next page.

Picture 15.2   Number 49

The integral $\int_0^1 \int_{-\sqrt{1-y^2}}^{+\sqrt{1-y^2}} 3y \, dx \, dy$ is taken over the

region

$x = -\sqrt{1-y^2} \rightarrow$ $\leftarrow x = +\sqrt{1-y^2}$
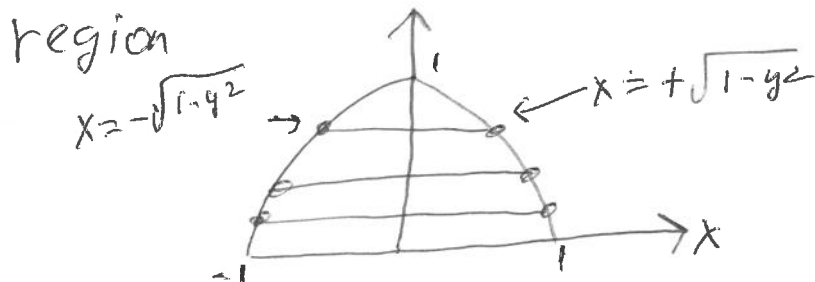
One can fill the same region with vertical lines:

$y = +\sqrt{1-x^2}$

$y = 0$
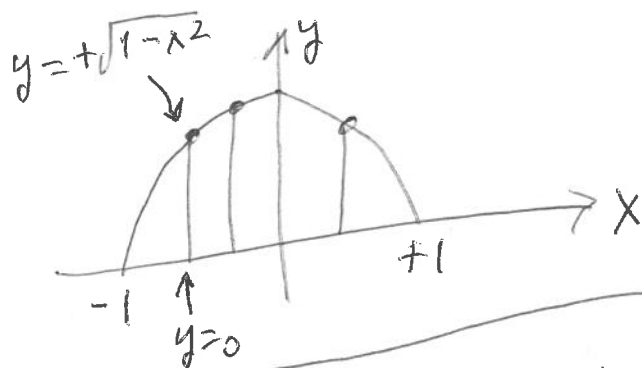
The old integral is equal to

$$\int_{-1}^1 \int_0^{\sqrt{1-x^2}} 3y \, dy \, dx$$