15.1, number 25: **Integrate $f(x,y) = \frac{1}{xy}$ over the square $1 \le x \le 2$, $1 \le y \le 2$.**

Answer: I fill in R using vertical lines. (See the next page.) For each fixed x, with $1 \le x \le 2$, y goes from 1 to 2.

$$\begin{aligned}\int\int_R \frac{1}{xy}\,dA &= \int_1^2 \int_1 2 \frac{1}{xy}\,dy\,dx \\ &= \int_1^2 \frac{1}{x} \ln y \Big|_1^2 dx \\ &= \int_1^2 \frac{1}{x}(\ln 2 - \ln(1))\,dx\end{aligned}$$

Of course, $\ln(1) = 0$.

$$\begin{aligned}&= (\ln 2) \ln x \Big|_1^2 \\ &= (\ln 2)(\ln 2 - \ln 1) \\ &= \boxed{(\ln 2)(\ln 2)}.\end{aligned}$$

Picture 15.1, Number 25