15.2, number 45: **Sketch the region of integration for**
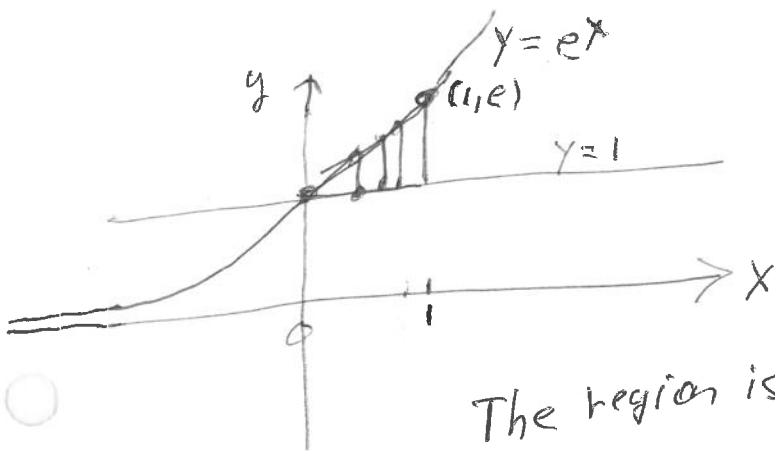
$$\int_0^1 \int_1^{e^x} dy\, dx.$$

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

Answer: The given integral represents the following region. For each fixed x with $0 \le x \le 1$, y goes from $y = 1$ to $y = e^x$. We draw this on the next page.

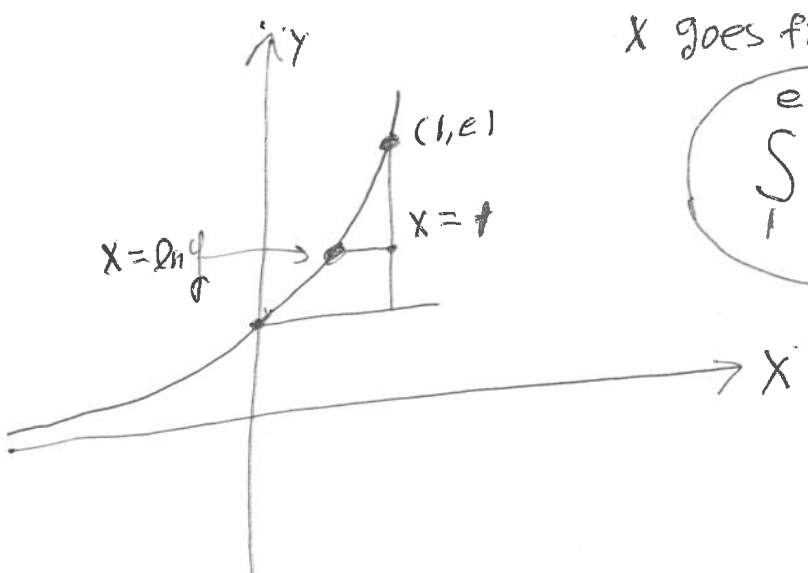Picture 15.2 Number 45

$$\int_0^1 \int_1^{e^x} dy\, dx$$ represents integration of the region described by "For each fixed x with $0 \le x \le 1$, y goes from $y=1$ to $y=e^x$."

$y = e^x$

$(1, e)$

$y = 1$

The region is filled with vertical lines.

We can fill the region with horizontal lines That is For each fixed y with $1 \le y \le e$

$(1, e)$

$x = 1$

$x = \ln y$

X goes from $\ln y$ to 1

$$\int_1^e \int_{\ln y}^1 dx\, dy$$