There is a "typo" in Problem 9:
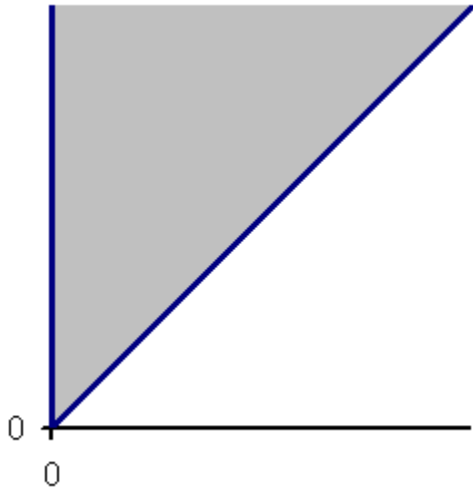
$x \leq y$ in the first quadrant

is this region:

However, the setup for the integral and the final answer are correct.