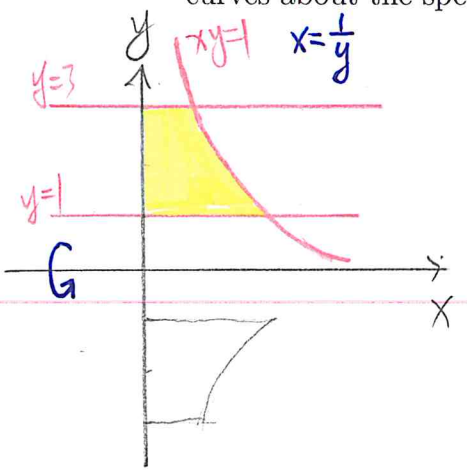
Name: Solutions

Quiz No. 3
Sections 1202, 1203
02/14/19

1. (5 pts.) Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.



$xy = 1$, $x = 0$, $y = 1$, $y = 3$; about the x-axis

$$\text{Volume} = \int_1^3 2\pi y \left(\frac{1}{y}\right) \cdot dy$$

$$= \int_1^3 2\pi \, dy$$

$$= 2\pi y \Big|_1^3$$

$$= 4\pi$$

2. (5 pts.) Determine if the integral below is convergent or divergent. If the integral is convergent, evaluate it.

$$\int_e^\infty \frac{1}{x(\ln x)^2} dx$$

Step 1. Let $u = \ln x$

$du = \frac{1}{x} dx$

$dx = x\,du$

Step 2 $\int \frac{1}{x(\ln x)^2} dx$

$= \int \frac{1}{x u^2} \cdot x\,du$

$= \int u^{-2} du = -u^{-1} + C$

$= -\frac{1}{\ln x} + C$

Step 3 $\int_e^\infty \frac{1}{x(\ln x)^2} dx$

$= \lim_{t\to\infty} \int_e^t \frac{1}{x(\ln x)^2} dx$

$= \lim_{t\to\infty} \left(-\frac{1}{\ln x}\right)\Big|_e^t$

$= \lim_{t\to\infty} \frac{-1}{\ln t} + 1$

$= 1$