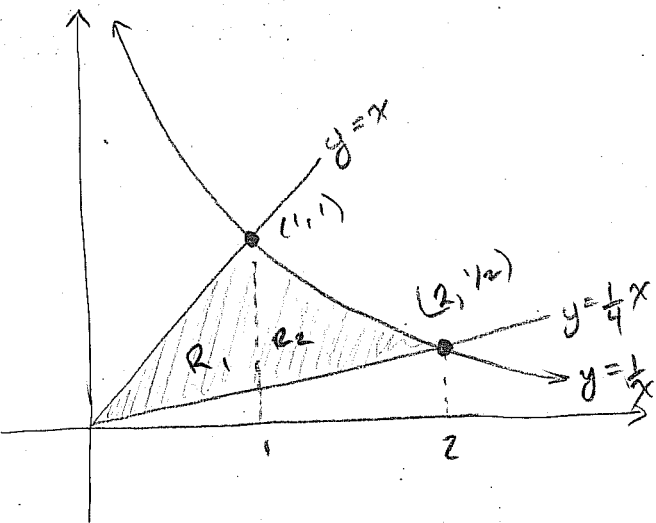Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 8 (B)

Question 1. *(5 marks)* Set up an integral that gives the area enclosed by the curves $y = 1/x$, $y = x$ and $y = \frac{1}{4}x$, with $x > 0$ but don't integrate (hint: sketch a graph).
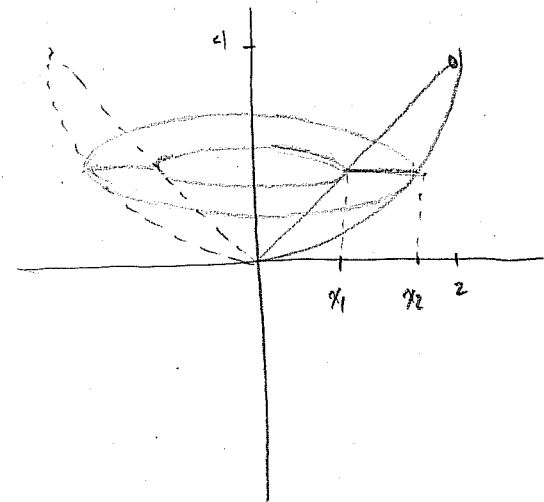
INTERSECTIONS: $\frac{1}{x} = x \Rightarrow x = \pm 1$, $\quad \frac{1}{4}x = x \Rightarrow x = 0$, $\quad \frac{1}{x} = \frac{1}{4}x \Rightarrow x = \pm 2$

$$\therefore A = \int_0^1 \left(x - \frac{1}{4}x \right) dx + \int_1^2 \left(\frac{1}{x} - \frac{1}{4}x \right) dx$$

$$\underbrace{\phantom{\int_0^1 \left(x - \frac{1}{4}x \right) dx}}_{R_1} \quad \underbrace{\phantom{\int_1^2 \left(\frac{1}{x} - \frac{1}{4}x \right) dx}}_{R_2}$$

Question 2. *(5 marks)* Using the "washer method" set up an integral that gives the volume of the solid generated by rotating the region enclosed by $y = x^2$ and $2x = y$ about the y-axis. Don't integrate this integral.

INTERSECTION: $x^2 = 2x \Rightarrow x = 0, 2$

$$V = \int_0^4 A(y)\,dy$$

$$A(y) = \pi R^2 - \pi r^2$$

$$R = x_2 = \sqrt{y}$$

$$r = x_1 = \frac{1}{2}y$$

$$\therefore V = \int_0^4 \pi \left(\sqrt{y} \right)^2 - \pi \left(\frac{1}{2}y \right)^2 dy$$