**WRITE YOUR NAME:**

MAC 2313 Quiz 15
Tuesday March 19th

Evaluate the integral

$$\iint_R (x+y)\,dA$$

where $R$ is the region bounded by $\underbrace{y = x^2}$ and $\underbrace{y = \sqrt{x}}$. Type 1 region

One of these is top curve, one is bottom curve

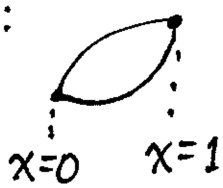
Intersections? Algebraically: $x^2 = \sqrt{x} \Rightarrow (x^2)^2 = (\sqrt{x})^2$

$x^4 = x \Rightarrow x^4 - x = 0$

But also, we just "know" the functions. $x(x^3-1) = 0$

$x = 0$ or $x = 1$

Picture of $R$:




$y = x^2$ is BOTTOM, $y = \sqrt{x}$ is TOP
(Could also use test input e.g. $x = \frac{1}{4}$)

$$\int_{x=0}^{x=1} \int_{y=x^2}^{y=\sqrt{x}} (x+y)\,dy\,dx = \int_{x=0}^{x=1} \left[ xy + \frac{y^2}{2} \right]_{y=x^2}^{y=\sqrt{x}} dx$$

$$= \int_{x=0}^{x=1} \left( \left( x \cdot x^{1/2} + \frac{x}{2} \right) - \left( x \cdot x^2 + \frac{x^4}{2} \right) \right) dx$$

$$= \int_{x=0}^{x=1} \left( x^{3/2} + \frac{x}{2} - x^3 - \frac{x^4}{2} \right) dx$$

$$= \left[ \frac{2}{5} x^{5/2} + \frac{x^2}{4} - \frac{x^4}{4} - \frac{x^5}{10} \right]_0^1 = \frac{2}{5} + \cancel{\frac{1}{4}} - \cancel{\frac{1}{4}} - \frac{1}{10}$$

$$= \frac{4}{10} - \frac{1}{10} = \frac{3}{10}$$