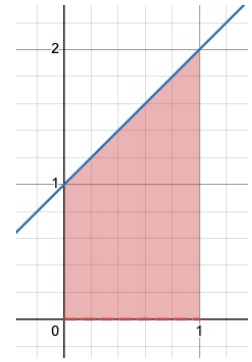
# Math 213 - 11.3 Double Integrals Problems

1. Sketch the region in the xy plane that is the base of the volume integral, and evaluate the integral:



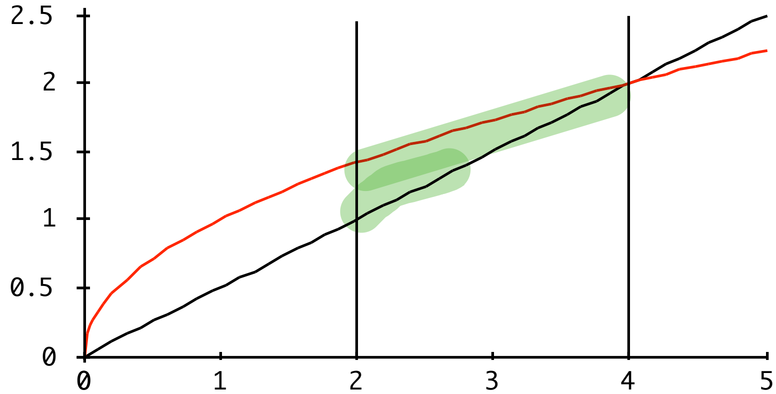

$$\int_0^1 \int_{y=0}^{1+x} (3x + 2y)\, dy\, dx$$

$$\int_{y=0}^{1+x} (3x + 2y)\, dy = 4x^2 + 5x + 1$$

$$\int \longrightarrow = \frac{29}{6}$$

2. Integrate $\iint_R xy\, dA$ where $R$ is the region bounded by the graphs of

$y = \sqrt{x}, \quad y = \frac{1}{2}x, \quad x = 2, \quad x = 4$ as seen below.



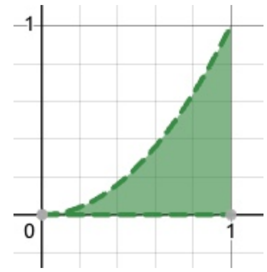

Int xy dy $= -\frac{1}{8}(x^2 - 4x)x$

Int _ dx $= -\frac{1}{32}x^4 + \frac{1}{6}x^3$

Int_2^4 _ dx $= \frac{11}{6}$

3. Evaluate $\int_0^1\int_{\sqrt{y}}^1 \sin\left(\pi x^3\right)dxdy$ by reversing the order of integration.

$$\int_0^1 \int_0^{x^2} \cdots \, dy \, dx$$




Int sin(pi x^3) dy $= x^2 \sin\left(\pi x^3\right)$

Int _ dx $= \dfrac{2}{3\pi}$

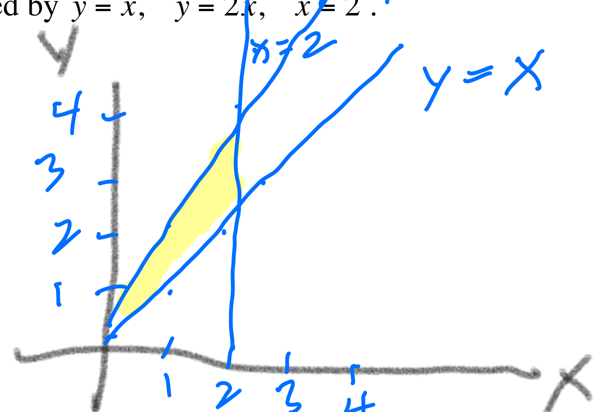
4. Set up an integral for both orders of integration. Do *not* evaluate.

$$\iint_R \frac{y}{x^2+y^2}\,dA$$

where $R$ is the triangle bounded by $y = x, \quad y = 2x, \quad x = 2$.

$y = 2x \Rightarrow x = \dfrac{y}{2}$

a. Sketch the region $R$.




b. Set up the integral for the order: $dy\,dx$.

$$\int_{x=0}^{2}\int_{y=x}^{2x} \frac{y}{x^2+y^2}\,dy\,dx$$

c. Set up the integral for the order: $dx\,dy$.

$$\int_{y=0}^{2}\int_{x=y/2}^{y} \frac{y}{x^2+y^2}\,dx\,dy + \int_{y=2}^{4}\int_{x=\frac{y}{2}}^{2} \frac{y}{x^2+y^2}\,dx\,dy$$