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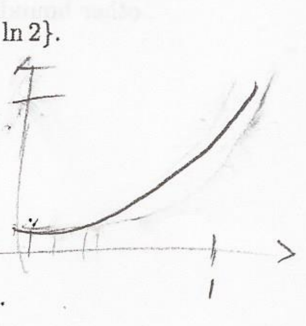
Worksheet ~~10~~ 21

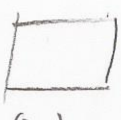
Exercise 1. Evaluate the average value of $f(x,y) = ye^{xy}$ on $R = \{(x,y) : 0 \le x \le 1, 0 \le y \le \ln 2\}$.

$\int\int_0^1 ye^{yx}$

$\boxed{\dfrac{1-\ln(2)}{\ln(2)} \approx 0.4427}$



$\int_0 e^{xy} \int_0^y e - 1$



$\ln(2)$

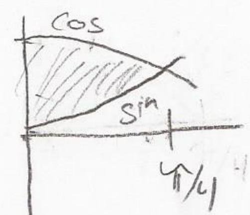
0-1

$e^y - y \Big|_0^{\ln 2}$ $2 - \ln(2) - 1 - 0 \approx 1 - \ln(2)$

Exercise 2. Draw the following regions for integration and set up an integral of $f(x,y)$ over the region

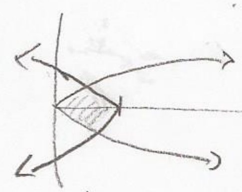
a. R in the xy-plane bounded by $x = 0$, $x = \frac{\pi}{4}$, $y = \sin x$, and $y = \cos x$.

$\iint_R f(x,y)$ $\int_{\sin x}^{\cos x}\int_0^{\pi/4} f(x,y)\,dA$ Switch!



b. R in the xy-plane bounded by $x = y^2$ and $x = 1 - y^2$.

$\int_{-\sqrt{1/2}}^{\sqrt{1/2}}\int_{y^2}^{1-y^2} f(x,y)\,dA$



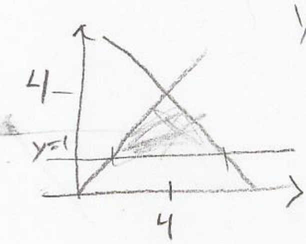
$y^2 = 1 - y^2$

$2y^2 = 1$

$y = \sqrt{1/2}$

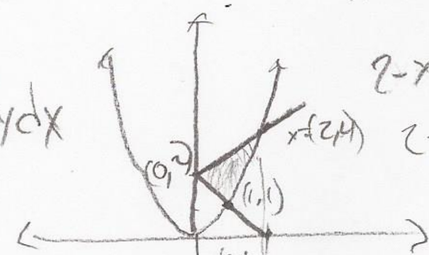
c. R in the xy-plane bounded by $y = x$, $y = 8 - x$, and $y = 1$.

$\int_1^4\int_y^{8-y} f(x,y)\,dx\,dy$



d. R in the xy-plane bounded by $y = x^2$, $y = -x + 2$, and $y = x + 2$.

$\int_0^1\int_{-x+2}^{x} (y^2+x)\,dy\,dx + \int_1^2\int_{x^2}^{x+2} (y^2+x)\,dy\,dx$



$x^2 = -x + 2$

$2 - x = x^2$

$2 = x(x+1)$

$1 = \frac{2-x}{x^2}$ $\frac{2}{x^2} - \frac{1}{x}$