Example: Consider plate R of density $\delta(x,y) = e^{x+y}$ gm./cm.^{2} at point $P = (x,y)$ and which is bounded by the graphs of $y = 2 - \frac{1}{2}x$, $x = 0$, and $y = 0$.

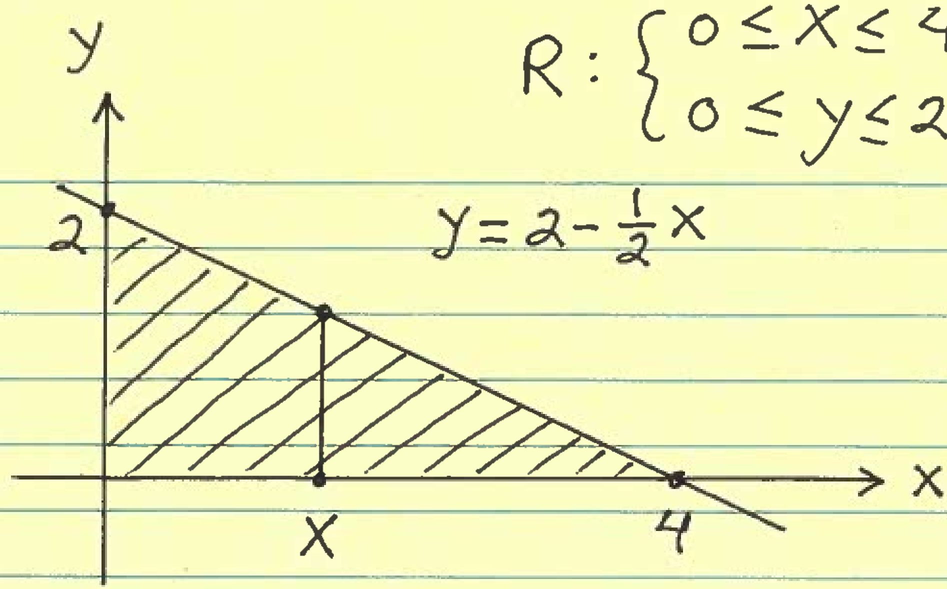
SET UP but DO NOT EVALUATE Double Integrals representing the plate's

1.) Area.
2.) Mass.
3.) Center of Mass.
4.) Centroid.
5.) Moment about the
   a.) x-axis.
   b.) y-axis.
   c.) line $y = 3$.
   d.) line $x = -2$.
6.) Moment of Inertia about the
   a.) point $(3,2)$.
   b.) x-axis.
   c.) y-axis.

$$R: \begin{cases} 0 \le x \le 4 \\ 0 \le y \le 2 - \frac{1}{2}x \end{cases}$$

density

$\delta(P) = e^{x+y}$



1.) Area $= \displaystyle\int_0^4 \int_0^{2-\frac{1}{2}x} 1 \, dy \, dx$ cm.^{2}

2.) Mass $= \displaystyle\int_0^4 \int_0^{2-\frac{1}{2}x} e^{x+y} \, dy \, dx$ gm.

3.)

$$\bar{x} = \frac{\displaystyle\int_0^4 \int_0^{2-\frac{1}{2}x} x e^{x+y} \, dy \, dx}{\displaystyle\int_0^4 \int_0^{2-\frac{1}{2}x} e^{x+y} \, dy \, dx} \text{ cm.},$$

$$\bar{y} = \frac{\displaystyle\int_0^4 \int_0^{2-\frac{1}{2}x} y e^{x+y} \, dy \, dx}{\displaystyle\int_0^4 \int_0^{2-\frac{1}{2}x} e^{x+y} \, dy \, dx} \text{ cm.}$$

4.) $$\bar{x} = \frac{\int_0^4 \int_0^{2-\frac{1}{2}x} x \, dy \, dx}{\int_0^4 \int_0^{2-\frac{1}{2}x} 1 \, dy \, dx} \text{ cm.},$$

$$\bar{y} = \frac{\int_0^4 \int_0^{2-\frac{1}{2}x} y \, dy \, dx}{\int_0^4 \int_0^{2-\frac{1}{2}x} 1 \, dy \, dx} \text{ cm.}$$

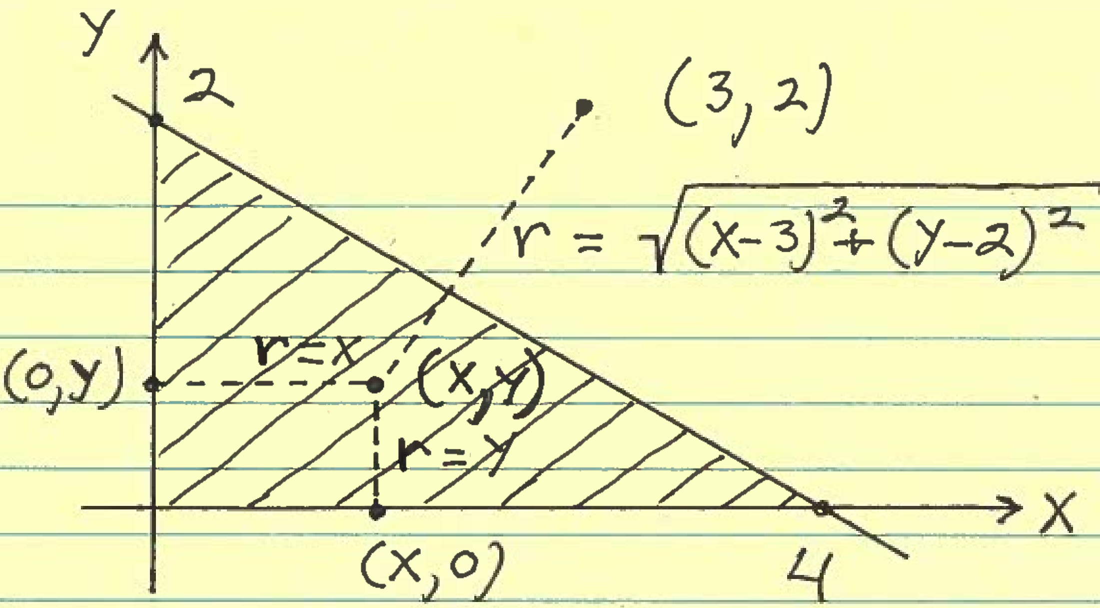
5.) a.) $M_{y=0} = \int_0^4 \int_0^{2-\frac{1}{2}x} (y-0) e^{x+y} \, dy \, dx$ (gm.)(cm.)

b.) $M_{x=0} = \int_0^4 \int_0^{2-\frac{1}{2}x} (x-0) e^{x+y} \, dy \, dx$ (gm.)(cm.)

c.) $M_{y=3} = \int_0^4 \int_0^{2-\frac{1}{2}x} (y-3) e^{x+y} \, dy \, dx$ (gm.)(cm.)

d.) $M_{x=-2} = \int_0^4 \int_0^{2-\frac{1}{2}x} (x+2) e^{x+y} \, dy \, dx$ (gm.)(cm.)

6.)



a.) $\text{M. of I.} = \int_0^4 \int_0^{2-\frac{1}{2}x} \left((x-3)^2 + (y-2)^2\right) e^{x+y} \, dy \, dx$

(gm.)(cm.^{2})

b.) $\text{M. of I.} = \int_0^4 \int_0^{2-\frac{1}{2}x} y^2 e^{x+y} \, dy \, dx$

(gm.)(cm.^{2})

c.) $\text{M. of I.} = \int_0^4 \int_0^{2-\frac{1}{2}x} x^2 e^{x+y} \, dy \, dx$

(gm.)(cm.^{2})