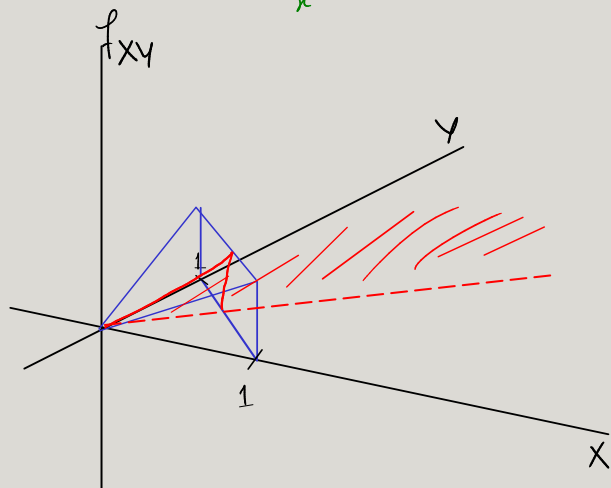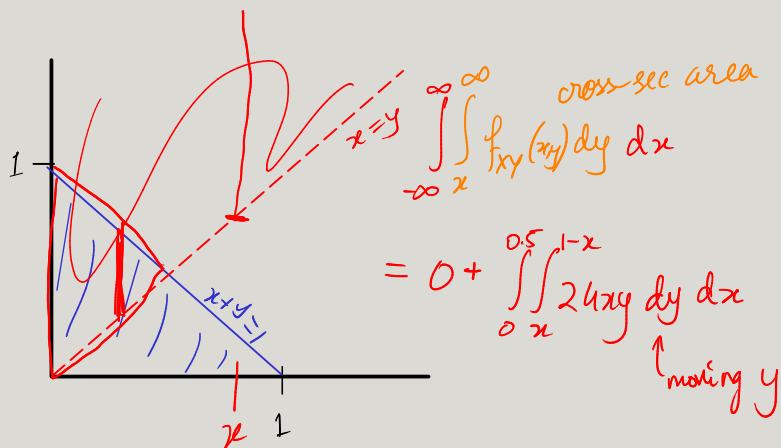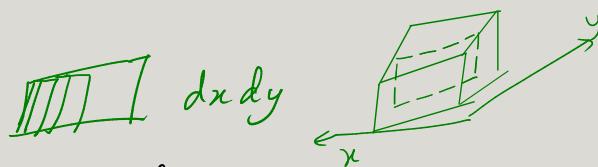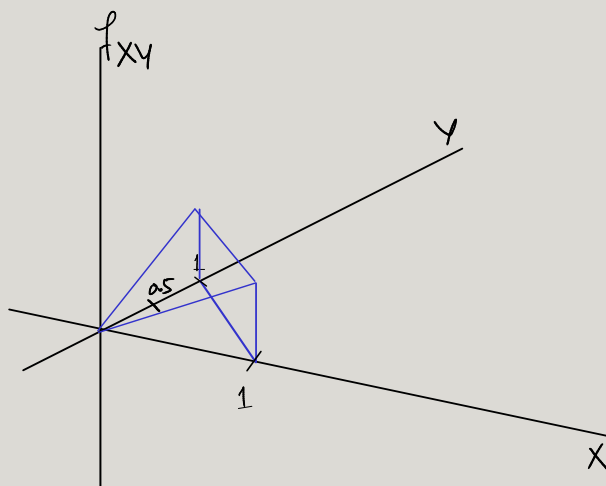$$f_{XY}(x,y) = \begin{cases} 24xy, & x,y \geq 0 \text{ and } 0 \leq x+y \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

$dx\, dy$

1

$x=y$

$x+y=1$

x 1

$$\int_{-\infty}^{\infty} \int_{x}^{\infty} f_{XY}(xy)\, dy\, dx \quad \text{cross-sec area}$$

$$= 0 + \int_{0}^{0.5} \int_{x}^{1-x} 24xy\, dy\, dx$$

moving y

f_{XY}

Y

1

1

X

0.5

$f_{X|Y=0.5}$

f_{XY}

Y

0.5 1

1

X
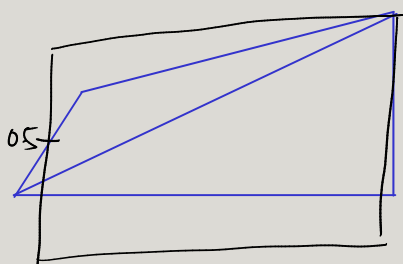
$$f_{X|Y}(x|y) = \frac{f_{XY}(xy)}{f_Y(y)}$$

integrate

$$Pr[x > 0.25 | Y > 0.5] = \frac{Pr[x > 0.25 \cap Y > 0.5]}{Pr[Y > 0.5]} \leftarrow \text{integrate}$$

X

Y

$Pr[x < Y] = \int$

Y

X