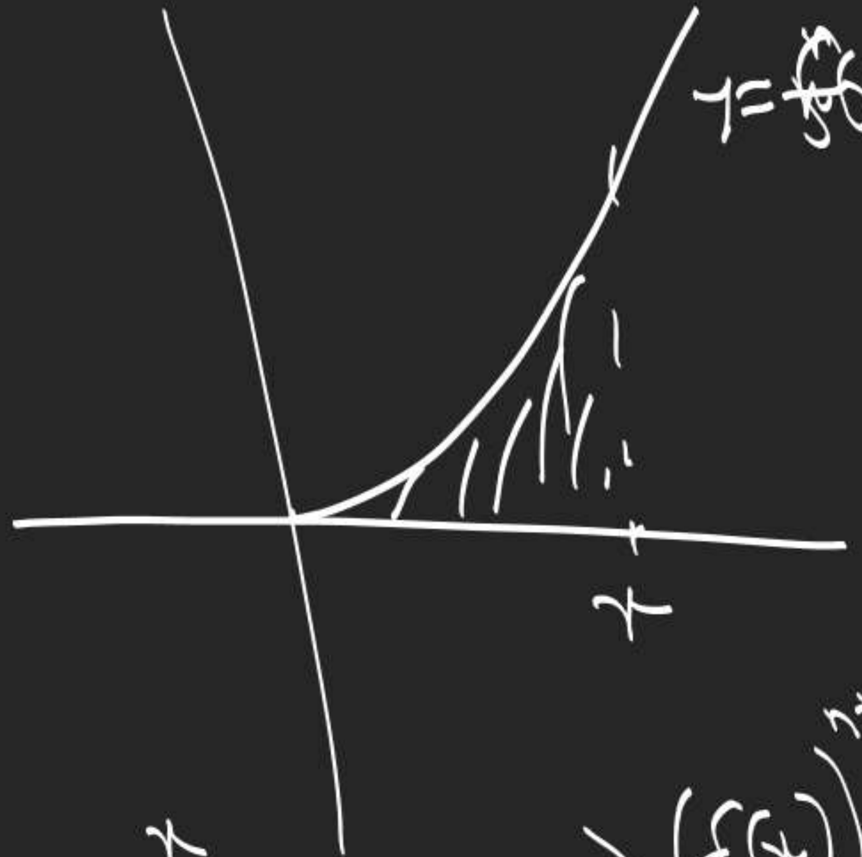
Nishant Jindal

$y=f(x)$



$\frac{dP}{dt} = -K(P-1000)$ $\quad K>0$

$\ln\left(\frac{P-1000}{1500}\right) = -Kt$

$t=10,\ P=1900$

$\ln\frac{3}{5} = -10K$

$t\to\infty,\ P=?$

$\int_{2500}^{P}\frac{dP}{P-1000}$

$\int_0^x f(t)\,dt = \lambda(f(x))^{n+1}$

$f(x) = \lambda(n+1)(f(x))^n f'(x)$

$x\to 0$

$x = \lambda(n+1)\frac{(f(x))^n}{n}$

$\boxed{(f(x))^n = x}$

α,β

α^2,β^2

$(\alpha,\beta)=(0,0),(1,1),(0,1),(\omega,\omega^2) \Leftarrow \alpha=\alpha^2\ \&\ \beta=\beta^2$

or

$\alpha=\beta^2\ \&\ \beta=\alpha^2$

$\alpha=\alpha^4 \Rightarrow \alpha=0,1,\omega,\omega^2$

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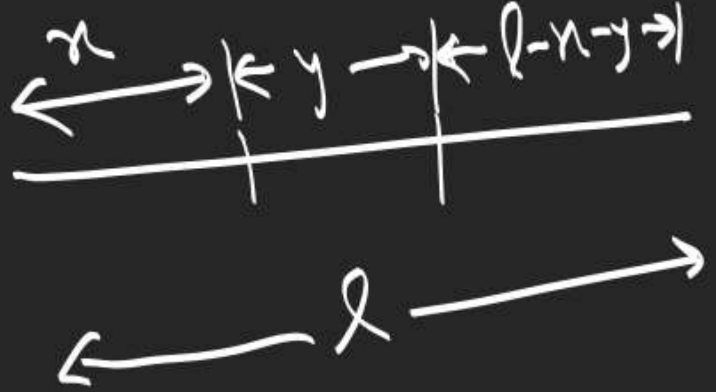
1.



$0 < x < l$

$0 < y < l$

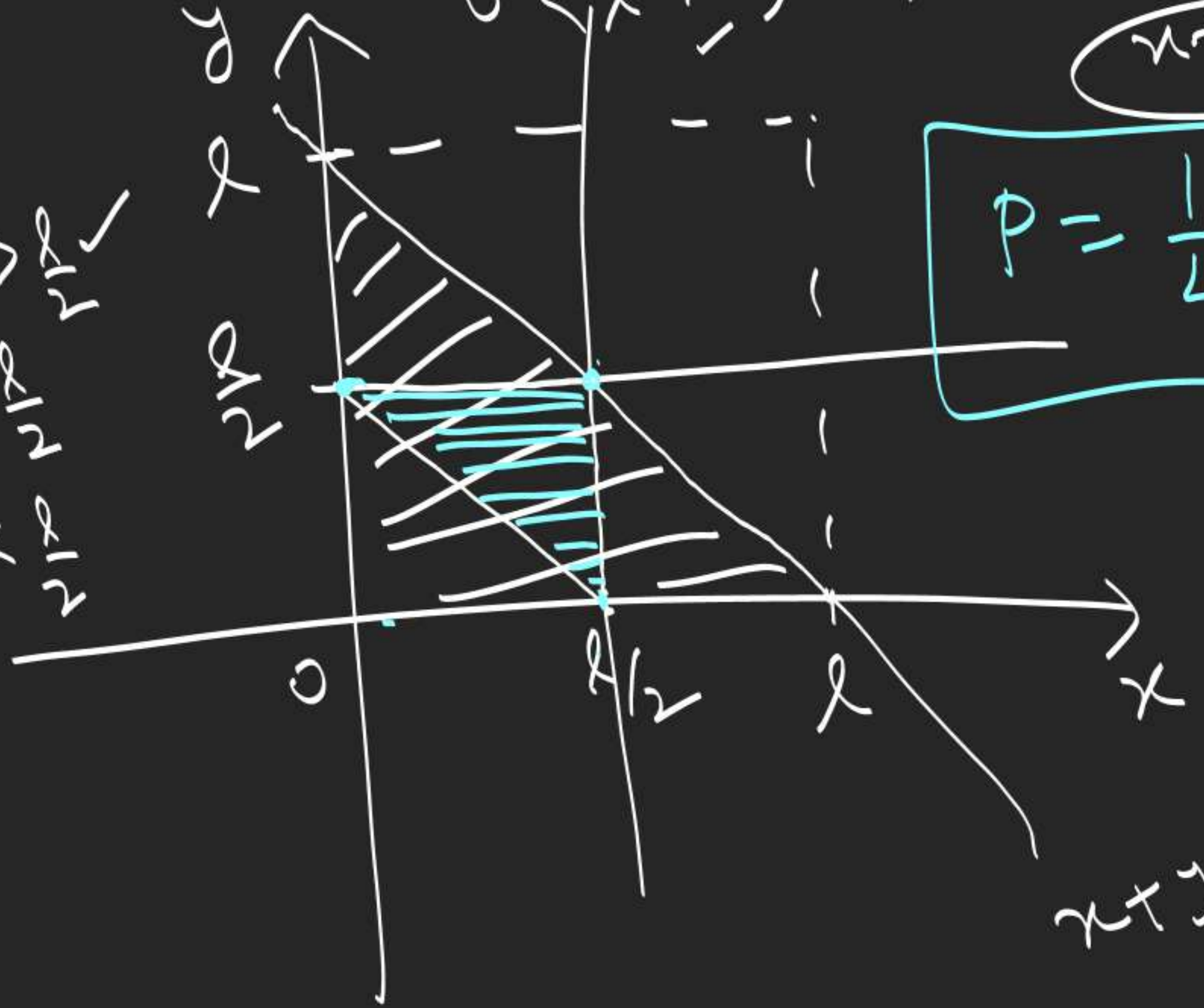
$0 < l-x-y < l \Rightarrow x+y>0$

$x+y<l$

$x+y > l-x-y \Rightarrow x+y > \frac{l}{2}$ ✓

$x+l-x-y > y \Rightarrow y < \frac{l}{2}$

$y+l-x-y > x \Rightarrow x < \frac{l}{2}$



$x+y=l$

$\boxed{P = \frac{1}{4}}$

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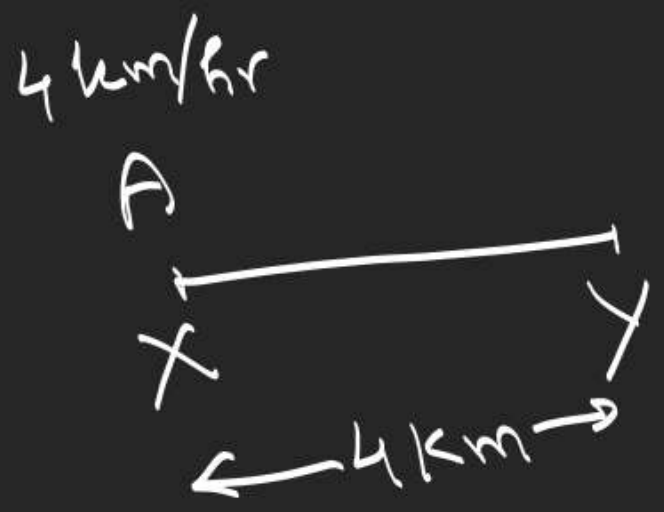
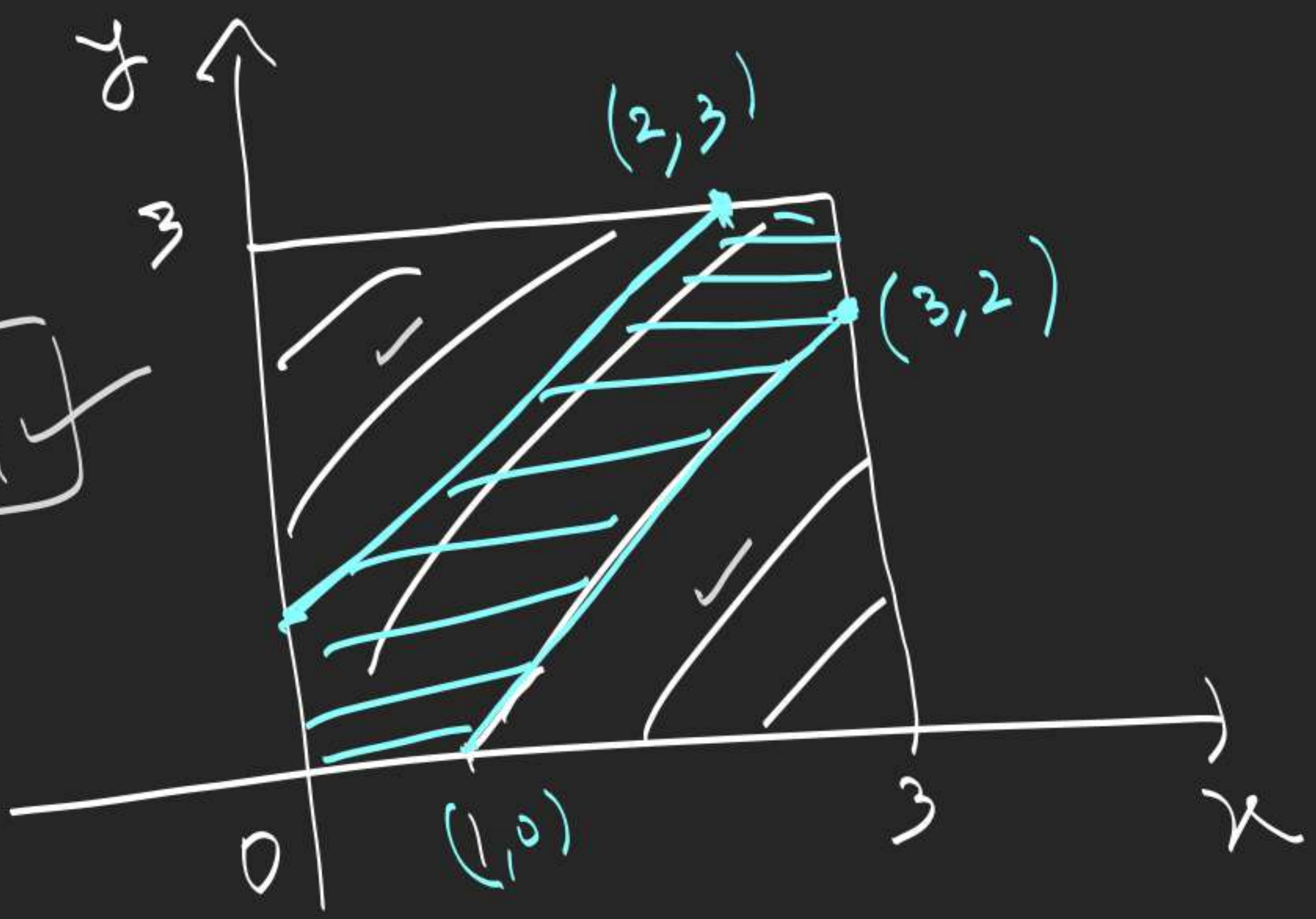
2.



$\boxed{5:4}$



A starts x hrs after 1 PM.

$0 < x < 3$

B — " — y — "

$0 < y < 3$

$|x-y| < 1$

$-1 < y-x < 1$

$$p = \frac{1 - 2\times\left(\frac{1}{2}\times 2\times 2\right)}{9}$$

$$= \boxed{\frac{5}{9}}$$

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Probability distribution over Random Variable

Standard Deviation

$\sigma = \sqrt{\text{Variance}}$

↓ means how total prob. of 1 is distributed over the values of random variable

X	1	2	3	4	5	6
P(X)	$\frac{11}{36}$	$\frac{9}{36}$	$\frac{7}{36}$	$\frac{5}{36}$	$\frac{3}{36}$	$\frac{1}{36}$

Mean, $\mu = \dfrac{\sum P_i x_i}{\sum P_i}$

Av. value of X / Most expected value of X.

$$\boxed{\mu = \sum P_i x_i}$$

$$\mu = \frac{11}{36}\times 1 + \frac{9}{36}\times 2 + \frac{7}{36}\times 3 + \frac{5}{36}\times 4 + \frac{3}{36}\times 5 + \frac{1}{36}\times 6 = \frac{91}{36}.$$

Variance, $\sigma^2 = \dfrac{\sum P_i (x_i - \mu)^2}{\sum P_i} = \sum P_i x_i^2 - 2\mu \underbrace{\sum P_i x_i} + \mu^2$

$$\sigma^2 = \left(\frac{11}{36}\times 1^2 + \frac{9}{36}\times 2^2 + \dots \frac{1}{36}\times 6^2\right) - \left(\frac{91}{36}\right)^2$$

$$\boxed{\sigma^2 = \left(\sum P_i x_i^2\right) - \mu^2}$$

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Probability Distribution Over Binomial Variate

Binomial Probability Distribution

no. of trials = 'n'

X = no. of success

X	0	1	2	. . . .	r	. . . .	n
P(X)					${}^{n}C_r p^r q^{n-r}$		

$$\mu = \sum_{r=1}^{n} \underbrace{r\,{}^{n}C_r}\, p^r q^{n-r} = np \sum_{r=1}^{n} {}^{n-1}C_{r-1}\, p^{r-1} q^{n-r}$$

$$= np(q+p)^{n-1}$$

$$(a+b)^n = \sum_{r=0}^{n} {}^{n}C_r\, a^{n-r} b^r$$

$$\boxed{\mu = np}$$

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$$\sigma^2 = \sum_{r=1}^{n} r^2\, {}^{n}C_r\, p^r q^{n-r} - (np)^2$$

$$\boxed{\sigma^2 = npq}$$

$$= n\sum_{r=1}^{n} ((r-1)+1)\, {}^{n-1}C_{r-1}\, p^r q^{n-r} - (np)^2$$

$$= n\sum_{r=2}^{n} \underbrace{(r-1)\, {}^{n-1}C_{r-1}}\, p^r q^{n-r} + n\sum_{r=1}^{n} {}^{n-1}C_{r-1}\, p^r q^{n-r} - (np)^2$$

$\boxed{Ex-II}$ / DPP-2

$$= n(n-1)p^2 \sum_{r=2}^{n} {}^{n-2}C_{r-2}\, p^{r-2} q^{n-r} + np\sum_{r=1}^{n} {}^{n-1}C_{r-1}\, p^{r-1} q^{n-r} - (np)^2$$

$$= n(n-1)p^2 + np - n^2p^2 = -np^2 + np = npq$$