Дефиниция (Гама разпр. сл. вел.) $X \in \Gamma(\alpha, \beta)$ $\alpha > 0,\ \beta > 0$ ако $f_X(x) = \beta^{\alpha} \dfrac{x^{\alpha-1} e^{-\beta x}}{\Gamma(\alpha)}$ $x > 0$

$$\Gamma(\alpha) = \int_0^{\infty} x^{\alpha-1} e^{-x} dx$$

$$\frac{1}{\Gamma(\alpha)} \int_0^{\infty} \beta^{\alpha} x^{\alpha-1} e^{\beta x} dx = 1;$$

⊕ $\alpha = 1$ $X \in \Gamma(1, \beta) = Exp(\beta)$

$f_X(x) = \dfrac{\beta e^{-\beta x}}{\Gamma(1)} = \beta e^{-\beta x}$ $x > 0$

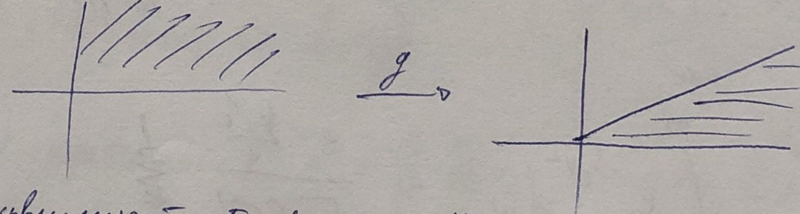
Твърдение $X_1 \in \Gamma(\alpha_1, \beta)$ и $X_2 \in \Gamma(\alpha_2, \beta)$ и $X_1 \perp\!\!\!\perp X_2$, то $X_1 + X_2 \in \Gamma(\alpha_1 + \alpha_2, \beta)$

Сл.) $X_i \in \Gamma(\alpha_i, \beta)$ $i = 1 \ldots n$ и $X_1 \ldots X_n$ са независими в съвкупност, то

$X_1 + \ldots + X_n \in \Gamma(\alpha_1 + \ldots + \alpha_n, \beta)$

Док.) $Y_1 = X_1 + X_2$
$Y_2 = X_2$

$$f_X(x_1, x_2) = \frac{\beta^{\alpha_1 + \alpha_2}}{\Gamma(\alpha_1)\Gamma(\alpha_2)} e^{-\beta(x_1 + x_2)} \qquad x_1 \geq 0,\ x_2 \geq 0$$

$DX =$  $g(DX)$

$X_1 \ldots X_n$ незав в съвкупност $\underset{\Gamma(1,\beta)}{\overset{}{Exp(\beta)}}$, то $\sum_{i=1}^{n} X_i \sim \Gamma(n, \beta)$

$EH = nEX_1 = \dfrac{n}{\beta}$

$DH = \dfrac{n}{\beta^2}$

Най-общо $X \in \Gamma(\alpha, \beta)$

$EX = \dfrac{\alpha}{\beta}$

$DX = \dfrac{\alpha}{\beta^2}$

Дефиниция (χ^2 разпределение с n степени на свобода)

$X \in \chi^2(n)$, ако $f_X(x) = \begin{cases} \dfrac{x^{n/2 - 1} e^{-x/2}}{2^{n/2}\Gamma(\frac{n}{2})} & x > 0 \\ 0 & \text{иначе} \end{cases}$ $X \in \chi^2(n)$, то $X \sim \Gamma(\frac{n}{2}, \frac{1}{2})$