$$= C_n^k \left(\frac{\lambda_1}{\lambda_1+\lambda_2}\right)^k \left(\frac{\lambda_2}{\lambda_1+\lambda_2}\right)^{n-k}.$$

Домашня робота

1)

$y \backslash x$	-1	0	1
-1	$\frac{1}{2}$	0	$\frac{1}{4}$
1	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

а)

X	-1	0	1
pi	$\frac{7}{12}$	$\frac{1}{12}$	$\frac{4}{12}$

Y	-1	1
pi	$\frac{3}{4}$	$\frac{3}{12}$

б) $P(Y=1 \mid X=1) = \dfrac{P(Y=1, X=1)}{P(X=1)} = \dfrac{\frac{1}{12}}{\frac{4}{12}} = \dfrac{1}{4}$

в) Умова незалежності $P(x, y) = P(x) \cdot P(y)$

$P(X=-1, Y=-1) = P(X=-1) \cdot P(Y=-1) = \frac{7}{12} \cdot \frac{3}{12} \neq \frac{1}{2}$.

Отже, X та Y — залежні

3) $\varphi_\xi(s) = \sum\limits_{k=0}^{\infty} s^k \cdot p_k$

$\varphi'_\xi(s) = \sum\limits_{k=0}^{\infty} k \cdot s^{k-1} p_k$, $\varphi'_\xi(1) = \sum\limits_{k=0}^{\infty} k p_k = M\xi$

$\varphi''_\xi(s) = \sum\limits_{k=0}^{\infty} k(k-1) s^{k-2} p_k$, $\varphi''_\xi(1) =$

$= \sum\limits_{k=0}^{\infty} k^2 p_k - \sum\limits_{k=0}^{\infty} k p_k = M\xi^2 - M\xi$. $M\xi^2 = \varphi''_\xi(1) + \varphi'_\xi(1)$

$\varphi'''_\xi(s) = \sum\limits_{k=0}^{\infty} (k^2-k)(k-2) s^{k-3} p_k$

$\varphi'''_\xi(1) = \sum\limits_{k=0}^{\infty} k^3 p_k - 3\sum\limits_{k=0}^{\infty} k^2 p_k + 2\sum\limits_{k=0}^{\infty} k p_k =$

$= M\xi^3 - 3M\xi^2 + 2M\xi$

$M\xi^3 = \varphi'''_\xi(1) + 3\varphi''_\xi(1) + 3\varphi'_\xi(1) - 2\varphi'_\xi(1) =$

$= \varphi'''_\xi(1) + 3\varphi''_\xi(1) + \varphi'_\xi(1).$

2) $M_f(\xi) = \sum_{k=1}^{\infty} f(k) \cdot P(\xi = k)$

$M\left(\frac{1}{1+\xi}\right) = \sum_{k=1}^{\infty}\left(\frac{1}{1+k} \cdot \frac{e^{-\lambda}\cdot\lambda^k}{k!}\right) =$

$= e^{-\lambda}\sum_{k=1}^{\infty}\left(\frac{\lambda^k}{(k+1)!}\right).$

Заміною $k+1 = n$

$\sum_{n=2}^{\infty} \frac{\lambda^{n-1}}{n!} = \sum_{n=2}^{\infty} \frac{\lambda^n}{n!} \cdot \frac{1}{\lambda}$

$e^{\lambda} - 1 - \lambda = \sum_{n=2}^{\infty} \frac{\lambda^n}{n!}$

$(e^{\lambda} - 1 - \lambda) \cdot \frac{e^{-\lambda}}{\lambda} = M\left(\frac{1}{\xi+1}\right)$

$M\left(\frac{1}{\xi+1}\right) = \frac{1 - e^{-\lambda} - \lambda \cdot e^{-\lambda}}{\lambda}$