

- Let X and Y be two independent RVs having the exponential distribution with the (different!) mean of 1 and 2 respectively. Find the PDF of:
 - $U \equiv X + Y$ (hint: use convolution),
 - $V \equiv \min(X, Y)$ and identify the resulting distribution. Hint: first find $1 - F_V(v) = \Pr\{\min(X, Y) > v\}$.
- Let X and Y have the bivariate Normal distribution with $\mu_X = 15, \mu_Y = -4, \sigma_X = 3, \sigma_Y = 2$ and $\rho_{X,Y} = -\frac{7}{9}$. Compute:
 - $\Pr(X - Y > 20)$ hint: first find the mean and standard deviation of $X - Y$,
 - $\Pr(X < 12.3 | Y = -2.1)$.
- Consider a RIS of size 12 from a Normal distribution with $\mu = 20$ and $\sigma = 3.7$. Compute
 - $\Pr\left(|\bar{X} - 20| < \frac{s}{3}\right)$,
 - $\Pr(s > 4)$, where \bar{X} and s are the corresponding sample mean and sample standard deviation respectively.
- Let X_1, X_2, X_3, X_4 and X_5 be a RIS of size 5 from the exponential distribution with the mean of 8. Compute:
 - $\Pr(\bar{X} > 6)$, where \bar{X} is the corresponding sample mean (hint: we know the distribution of the *sum* of the five X s),
 - $\Pr\{X_1 + X_2 + X_3 > 2X_4 + 2X_5\}$. Hint: we know the distribution of $\frac{X_4 + X_5}{X_1 + X_2 + X_3 + X_4 + X_5}$.
- Let X and Y be two RVs having the following joint PDF:

$$f(x, y) = \begin{cases} 10x^2 + 4xy & \text{when } x > 0, y > 0 \text{ and } x + y < 1 \\ 0 & \text{otherwise} \end{cases}$$

Find

- (a) the conditional PDF of X given that $Y = \frac{1}{3}$ (do not forget to stipulate its support),
- (b) the mean and the *median* of Y (hint: use the marginal distribution of Y).