1. Let us consider a random variable X with the following p.d.f.
$$f_X(x) = \begin{cases} \frac{\theta}{x^{(\theta+1)}}, & x \geq 1 \\ 0, & \text{elsewhere} \end{cases}$$
Let $Y = \ln X$, i.e. $Y = \log_e X$. Find the p.d.f. of Y.

2. Let X be a random variable which follows the standard normal distribution i.e. $X \sim N(0,1)$. If $Y = X^2$, find the p.d.f. of Y. Use the moment generating function technique.

3. Let X_1 and X_2 be two independent random variables with $X_1 \sim Poisson(\lambda)$ and $X_2 \sim Poisson(\lambda)$. What do you think is the distribution of $Y = u(X_1, X_2) = X_1 + X_2$?

4. Let X and Y be two random variables with joint p.d.f.; which is given as
$$f_{(x,y)} = \begin{cases} 12xy(1-y), & \text{for} \quad 0 < x < 1, \quad 0 < y < 1 \\ 0, & \text{elsewhere} \end{cases}$$
Find the joint probability of the random variables given as $U = XY^2$ & $V = Y$.

5. Let X be a uniformly distributed random variable, on the circumference of a circle. Then find the density function of $Y = \sin X$.

6. Let X be a random variable with probability density function
$$f_X(x) = \begin{cases} 6x(1-x), & \text{for} \quad 0 < x < 1 \\ 0, & \text{elsewhere} \end{cases}$$
Use the distribution function technique to compute the p.d.f. of $Y = X^3$.