

Important tips:

moment generating function (m.g.f.)

$$M_X(t) = E(e^{tX}), \quad t \in R$$

The m.g.f. DOES NOT EXIST
for all random variable X.

$$E(X^r) = \mu_r' = \frac{d^r}{dt^r} (M_X(t)) \quad \text{at } t = 0$$

$$\text{Mean} = E(X)$$

$$\text{Variance} = E(X^2) - [E(X)]^2$$

Properties:

- 1) $M_{cX}(t) = M_X(ct)$
- 2) $M_{X_1+X_2}(t) = M_{X_1}(t)M_{X_2}(t)$
for independent r.v.'s
- 3) If $Y = \frac{X-a}{h}$ then
 $M_Y(t) = e^{-\frac{at}{h}} M_X\left(\frac{t}{h}\right)$
- 4) $M_X(t) = M_Y(t) \Rightarrow$
X & Y are identically distributed.

If $X \sim B(x; n, p)$ with m.g.f. given as $(0.2 + 0.8e^t)^7$, then $\mu_2' =$

35.41

40.33

32.48

29.74

For a random variable X, with m.g.f. $M_X(t) = (1 - 2t)^{-3}$, the value of $E(X^3)$ is
a)120 b)240 c)360 d) 480

Ans d

For a random variable X, with m.g.f. $M_X(t) = e^{t^2-3t}$ and $E(X^2) = 11$, the value of Variance of X is

a) 20 b) 14 c) 2 d) 9

Ans c

For a random variable X , m.g.f $M_X(t) = \frac{1}{(1-3t)^2}$ and $Y = 3X$, then $M_Y(t) =$

- (A) $\frac{3}{(1-3t)^2}$ (B) $\frac{9}{(1-3t)^2}$ (C) $\frac{1}{(3-t)^2}$ (D) $\frac{1}{(1-9t)^2}$

Ans d

For a random variable X , m.g.f $M_X(t) = \frac{e^t}{(1-t)}$ and $Y = X + 3$, then $M_Y(t) =$

- (A) $\frac{3e^t}{(1-t)}$ (B) $\frac{e^{4t}}{(1-t)}$ (C) $\frac{e^{t+3-3t}}{(1-t)}$ (D) $\frac{e^t}{(1-t)}$

If $X \sim P(x; \lambda)$ with m.g.f. given as $e^{5(e^t-1)}$, then $\lambda =$

[1]

- a) 16 b) 50 c) 30 d) 5

Ans d

The moment generating function of a random variable X is given by

$$M_X(t) = \frac{1}{6} + \frac{1}{3}e^t + \frac{1}{3}e^{2t} + \frac{1}{6}e^{3t}, \quad -\infty < t < \infty.$$

Then $P(X \leq 2)$ equals

- a) $1/3$ b) $1/6$ c) $1/2$ d) $5/6$

Ans d

$$M_X(t) = \sum e^{tx} \cdot p(x)$$

x	0	1	2	3
$p(x)$	$1/6$	$1/3$	$1/3$	$1/6$

For a random variable X , m.g.f $M_X(t) = \frac{1}{(1-3t)^2}$ and $Y = 3X$, then $M_Y(t) =$

- (A) $\frac{3}{(1-3t)^2}$ (B) $\frac{9}{(1-3t)^2}$ (C) $\frac{1}{(3-t)^2}$ (D) $\frac{1}{(1-9t)^2}$

Ans d

For a random variable X , m.g.f $M_X(t) = \frac{e^t}{(1-t)}$ and $Y = X + 3$, then $M_Y(t) =$

- (A) $\frac{3e^t}{(1-t)}$ (B) $\frac{e^{4t}}{(1-t)}$ (C) $\frac{e^{t+3-3t}}{(1-t)}$ (D) $\frac{e^t}{(1-t)}$

Ans b

If m.g.f. for a random variable X is

$$\Rightarrow M_X(t) = \left(\frac{e^{t/2} + e^{-t/2}}{2} \right)^2, -\infty < t < \infty$$

Then m.g.f. of $Y = 2X$ is

$2X \rightarrow M(2t)$
 $X \rightarrow$
 $cX \rightarrow t \rightarrow 2t$
 $\frac{ct}{2}$

$$\left(\frac{e^t + e^{-t}}{2} \right)^2$$

Let $Y = 2X + 3$. If $M_X(t)$ and $M_Y(t)$ are the moment generating functions of X and Y , respectively then $M_Y(t)$ is

- a) $e^{-3t} M_X(2t)$ b) $e^{3t} M_X(2t)$ c) $e^{2t} M_X(3t)$ d) $e^{-2t} M_X(3t)$

$$\begin{aligned}
 Y &= X + a \\
 M_Y &= e^{at} \cdot M_X(t) \\
 &= e^{3t} M_X(2t)
 \end{aligned}$$

The m.g.f. of a random variable X is given by $M_X(t) = e^{3(e^t-1)}$. The value of $P(X = 1)$.

- a) 0.1494 b) 0.1532 c) 0.5671 d) none of these

Ans d

If the mgf of the negative binomial distribution is $\left(\frac{2e^t}{3-e^t}\right)^3$, then the variance is
a) 9/2 b) 9/4 c) 3/2 d) none

Ans b

If the mgf of the geometric distribution is $\frac{2e^t}{3-e^t}$, then the probability of 1st success in 4th trial is
a) 2/9 b) 1/81 c) 2/81 d) none

Ans c