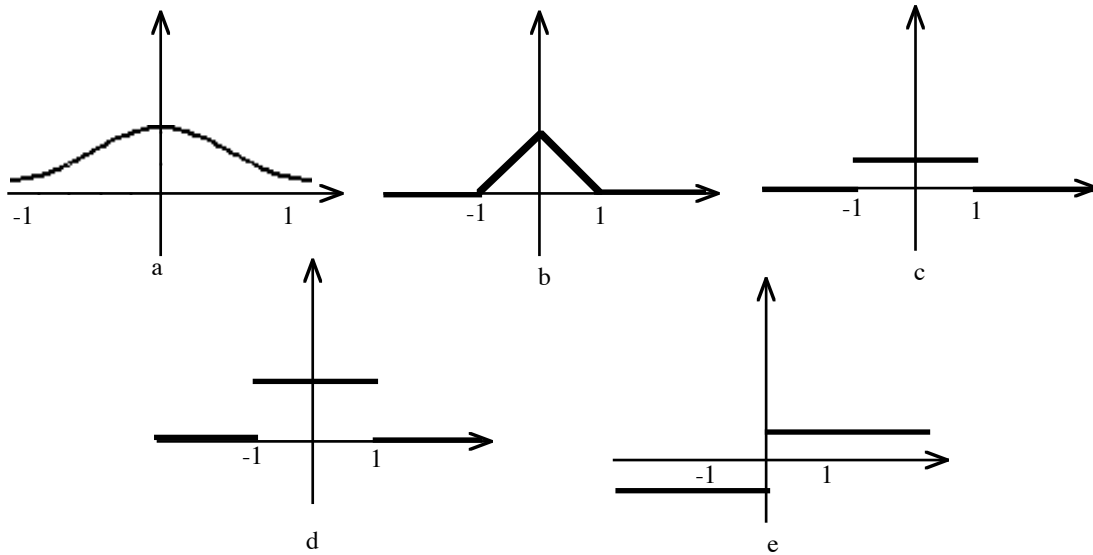


Student's name.....

A random variable  $X$  is uniformly distributed over the interval  $[-1, 1]$

1. Which of the following is a graph of the density function of the random variable?

Answers:



2. What is the probability  $P(X \leq \frac{1}{2})$ ?

3. What is the probability  $P(X > 0)$ ?

4. What is the expectation  $E(X)$ ?

5. What is the variance  $V(X)$ ?

**Answers to questions 3 - 5:**

(a)  $-\frac{1}{2}$ ,

(b) 0,

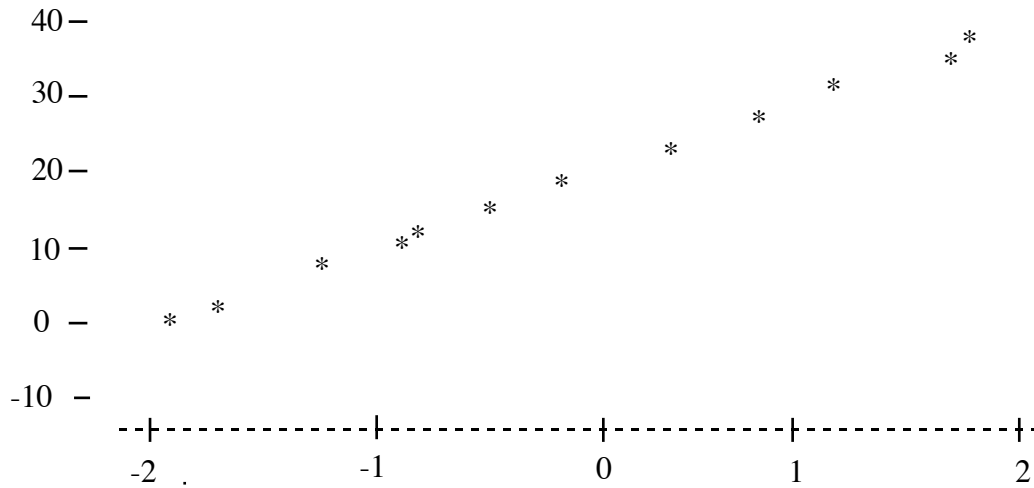
(c)  $\frac{1}{3}$ ,

(d)  $\frac{1}{2}$ ,

(e)  $\frac{3}{4}$

Student's name.....

The following is a Q-Q plot for a certain random variable



6. Is the normal distribution a good model?

Answers: (a) Yes, (b) No

7. What is the expectation of  $X$ ?

8. What is the standard deviation of  $X$ ?

**Answers to questions 7 and 8:**

(a) -10,                      (b) 0,                      (c) 10,                      (d) 20                      (e) 35

Student's name.....

A random variable  $X$  has a normal distribution with mean 1 and standard deviation 2

9. Find a value  $x$ , such that  $P(X \leq x) = 0.6$ .

**Answers** (Values rounded to one decimal place):

(a) 0.3                      (b) 0.6                      (c) 1.5                      (d) 2.0                      (e) 2.5

10. Find the probability  $P(0.5 \leq X \leq 1.5)$ .

**Answers** (Values rounded to three decimal places):

(a) 0.013,                      (b) 0.197                      (c) 0.705                      (d) 0.922                      (e) 1.016

11. The life length of a gadget follows an exponential distribution with mean 10 years. Find the probability that the gadget lasted less than 7 years.

**Answers** (Values rounded to three decimal places):

(a) 0.012

(b) 0.132

(c) 0.503

(d) 0.667

(e) 0.951

Student's name.....

The moment generating function a random variable  $X$  is  $M(t) = e^{t+t^2}$ .

12. Find the expected value  $E(X)$ .

13. Find the variance  $V(X)$ .

**Answers to questions 12-13:**

(a) -2

(b) 0

(c) 1

(d) 2

(e) 3

14. What kind of distribution does  $X$  have?

(a) uniform, (b) exponential, (c) normal, (d) other, (e) it is not a moment generating function



Student's name.....

The joint density function of two random variables  $X_1$  and  $X_2$  is given by the formula

$$f(x_1, x_2) = \begin{cases} 2(1-x_2) & \text{for } 0 \leq x_1 \leq 1 \text{ and } 0 \leq x_2 \leq 1 \\ 0 & \text{elsewhere.} \end{cases}$$

**15.** Find the probability  $P(X_1 > X_2)$ .

**16.** Find the conditional probability  $P(X_1 > X_2 \mid X_2 = \frac{1}{2})$ .

**17.** Find the probability  $P(X_1 > \frac{1}{2})$ .

**18.** Find the mean  $E(X_2)$ .

**Answers to questions 15 - 18:**

(a) 0

$\frac{1}{3}$

(b)

(c)  $\frac{1}{2}$

(d)  $\frac{2}{3}$

(e)  $\frac{3}{4}$

Student's name.....

The random variables  $X_1$  and  $X_2$  have means 2 and 1 and variances 4 and 9 respectively. Their coefficient of correlation is 0.5

19. Find the covariance  $\text{cov}(X_1, X_2)$ .

20. Find the expected value of the product  $E(X_1 X_2)$ .

21. Find the variance of the difference  $V(X_1 - X_2)$ .

**Answers to question 17 - 19:**

(a) -2

(b) 1

(c) 3

(d) 5

(e) 7