Note Title 2/11/2011

IV How to start from a cdf $F_X(x)$ to derive the pdf $f_X(x)$?

Ans:

Exercise: Find & plot the cdf $F_X(x)$ for an exponential R.V.

Properties of a cdf $F_X(x)$

1.

2.

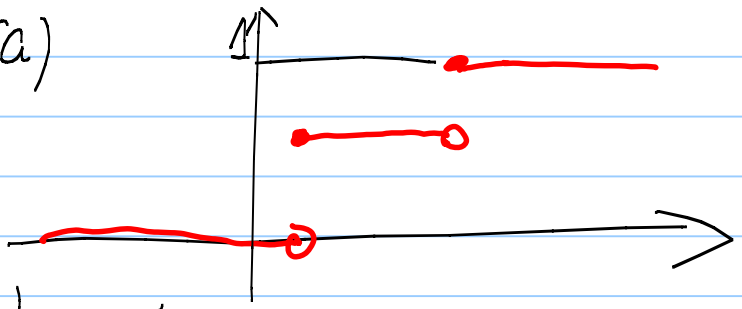
3.

4.

5.

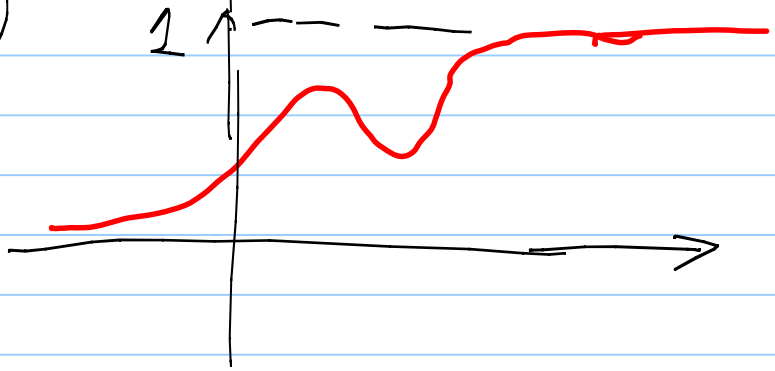
Ex: Which of the following figures can be a valid cdf $F_X(x)$

(a)

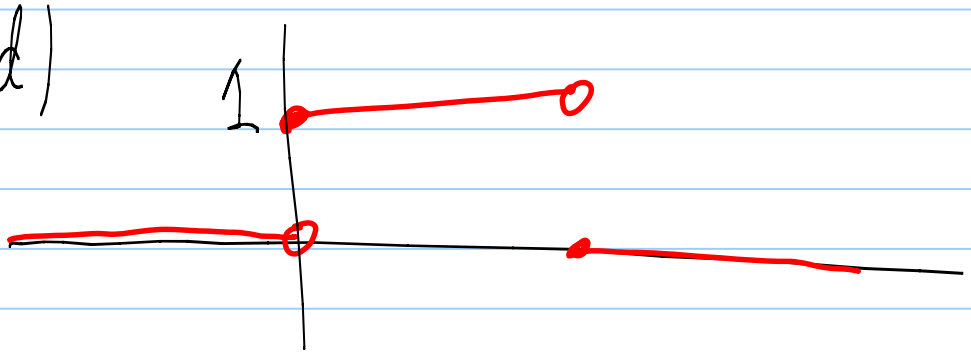


(b)

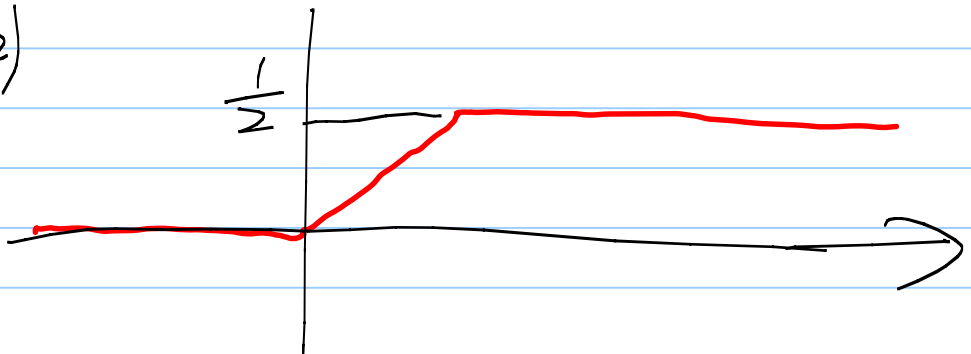
(c)



(d)



(e)



The [ ] is less straightforward than the [ ] &

[ ] ex: $F_X(x)$ the x can be fractional even when X is a discrete R.V.

However there are many advantages to use a cdf $F_X(x)$

* ① Applies to both discrete & conti R.V.

② Can be used to compute probabilities

Ex: Given a R.V. X with cdf $F_X(x)$

for example $F_X(x) = \begin{cases} 0 & \text{if } x<0 \\ x & \text{if } 0 \le x < 1 \\ 1 & \text{if } 1 \le x \end{cases}$

(or $F_X(x) = U(x)$)

Find

Q: $P(X \le a) = ?$

Q: $P(a < X) = ?$

Q: $P(a < X \le b) = ?$

Q: $P(X < a) = ?$

Q: $P(a \le X) = ?$

Q: $P(a \le X \le b) = ?$

in terms of $F_X(x)$

Q: $P(X=a) = ?$ Q: $P(a<X<b) = ?$

Q: $P(a \leq X < b) = ?$

Ans:

0911

Ex: HW6Q9 Prob 4.13

$$F_X(x) = \begin{cases} 0 & \text{if } x < 0 \\ 1 - \frac{1}{4}e^{-2x} & \text{if } 0 \le x \end{cases}$$

Plot $F_X(x)$

Q: $P(X \le 2)$, $P(X = 0)$, $P(X < 0)$

$P(2 < X < 6)$. $P(X > 10)$.

Ans:

Q $P(0 < X \leq 6) = ?$

Ans:

Advantage of using cdf:

③ Characterizing R.V.s of mixed type.

Discrete R.V. Conti

R.V. of mixed type

Ex: HW 6 Q9 Prob. 4.13.

Ex: