

Quantiles

STAT-S520

(continued)

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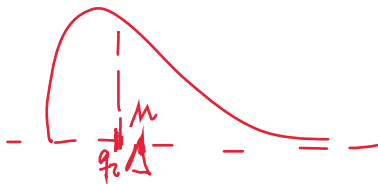
Symmetry

- ▶ Let X be a continuous random variable with PDF f . If there exists a value $\theta \in \mathbb{R}$ such that

$$f(\theta + x) = f(\theta - x)$$

for every $x \in \mathbb{R}$, then X is a symmetric random variable and θ is its center of symmetry

- ▶ If Y is not symmetric, there is not a single way to measure centrality



Theorem 6.1

Let X be a random variable with population median q_2 and population mean $\mu = EX$. Then

1. The value of c that minimizes $E|X - c|$ is $c = q_2$
2. The value of c that minimizes $E(X - c)^2$ is $c = EX$

*absolute
deviation*

*squared
deviation*

ISI 6.4 Exercise 2

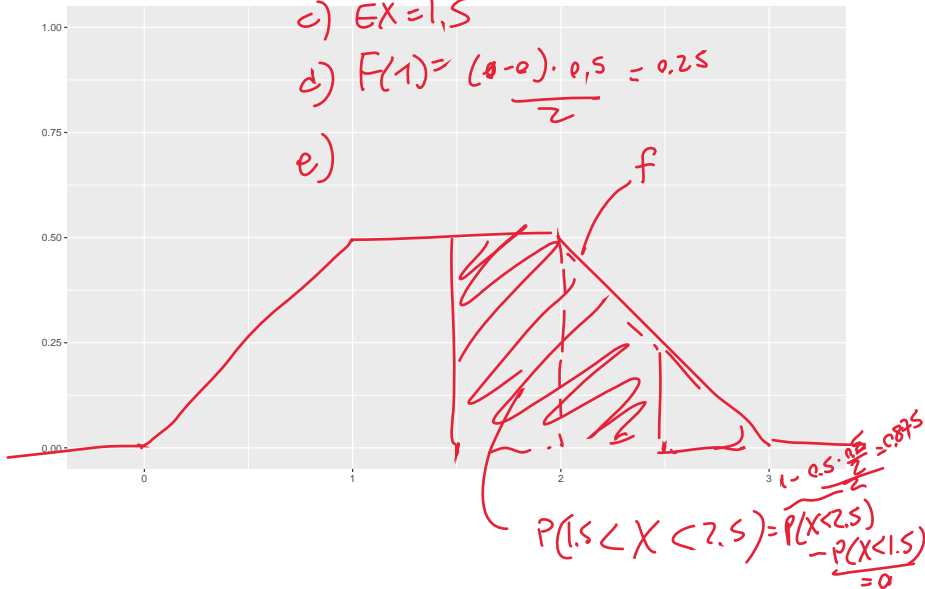
a) $c = \frac{1}{2}$

b) $0.875 - 0.5 = \underline{0.375}$

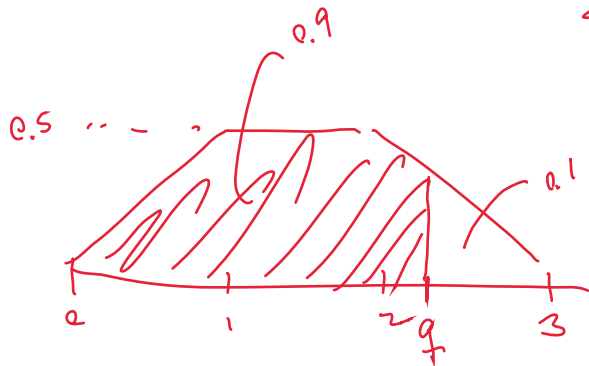
c) $EX = 1.5$

d) $F(1) = \frac{(1-0) \cdot 0.5}{2} = 0.25$

e)



ISI 6.4 Exercise 2 (cont.)



$$P(X < q) = 0.9$$

$$\frac{(3-q)(3-q)}{2} = 0.1$$

$$\frac{(3-q)^2}{4} = 0.1$$

$$(3-q) = \sqrt{0.4}$$

$$q = 3 - \sqrt{0.4}$$

ISI 6.4 Exercise 7

$$\frac{7d}{\checkmark} \quad \sigma = \sqrt{\sigma^2} = \sqrt{\text{Var } X} = \sqrt{\sum_{x \in X(S)} (x - \mu)^2 f(x)}$$

$$f(x) \quad \left\{ \right.$$