

Economics 257

October 4, 2016

R. Davidson

Practice for the Midterm

1. Show that

$$\begin{aligned} P(A \cup B \cup C) &= P(A) + P(B) + P(C) \\ &\quad - P(A \cap B) - P(A \cap C) - P(B \cap C) \\ &\quad + P(A \cap B \cap C). \end{aligned}$$

2. There are three plants that produce a given screw: A , B , and C . Plant A produces twice as many screws as B and C , whose productions are at par. In addition, quality control is better at plants A and B in that only 2% of the screws they produce are defective as opposed to 4% in plant C . Suppose that we sample one screw from the warehouse that collects all screws produced by A , B , and C . What is the probability that the screw is defective? What is the probability, conditional on the screw being defective, that it is from plant A ?

3. Let X be a continuous random variable with density function

$$f_X(x) = \begin{cases} 2x & \text{if } 0 < x < 1, \\ 0 & \text{otherwise} \end{cases}.$$

Does this definition respect the regularity conditions for a density? What is the corresponding cumulative distribution function (CDF)?

Let $Y = 3X + 1$. The random variable Y is therefore a shifted and rescaled version of X . What are the density and CDF of Y ?

4. The number of males and females enrolled in colleges (undergraduate and postbaccalaureate) in the United States from 2000 through 2008 is given here. Graphically present these data with a time-series plot.

College Enrollment (in thousands)	Males	Females
2000	6,721.8	8,590.5
2001	6,960.8	967.2
2002	7,202.1	9,409.6
2003	7,255.6	9,644.9
2004	7,387.3	9,884.4
2005	7,455.9	10,031.6
2006	7,574.8	10,184.1
2007	7,815.9	10,432.2
2008	8,188.9	10,913.9