MATH 10B
Section 205
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Quiz 9 Solution

Student:
SID:
Tue 4/2/19

True/False - No explanation needed. (For each: 1 point if correct, 0 points if not answered, -1 points if incorrect)

1. The function $f(x) = 2$ for $\frac{1}{4} \leq x \leq \frac{3}{4}$, $f(x) = 5$ for all $x \in \mathbb{Z}$, and $f(x) = 0$ otherwise. $f(x)$ is a valid PDF. True/False

   True. We have $\int_{\infty}^{\infty} f(x) = 1$, and $f(x)$ is nonnegative.

2. If $f(x)$ is a PDF, then we necessarily have

$$\int_0^{\infty} f(x)dx \geq \int_5^{\infty} f(x)dx$$

   True/False

   True. This is saying $P(0 \leq X \leq \infty) \geq P(5 \leq X \leq \infty)$

Problems - Needs justification.

1. Call $f(x) = \frac{2}{(2+x)^2}$ for $0 \leq x \leq \infty$ and 0 otherwise.

   (a) Verify this is a valid PDF

   (b) What is the CDF?

   (c) If X is the random variable with PDF x, what is $P(1 \leq X \leq 2)$?

   (10 points)

   (a)

$$\int_{-\infty}^{\infty} f(x)dx = \int_0^{\infty} \frac{2}{(2+x)^2}dx = -\frac{2}{2+x}\Big|_0^{\infty} = 0 - (-1) = 1$$

   also $f(x)$ is nonnegative.

   (b) The CDF $F(x) = 0$ for $x \leq 0$ and $1 - \frac{2}{2+x}$ for $x \geq 0$.

   (c) This is

$$\int_1^2 \frac{2}{(2+x)^2}dx = -\frac{2}{2+x}\Big|_1^2 = \frac{2}{3} - \frac{2}{4} = \frac{1}{6}$$