Section 6.2: The Uniform Probability Distribution

Monday, May 27, 2013
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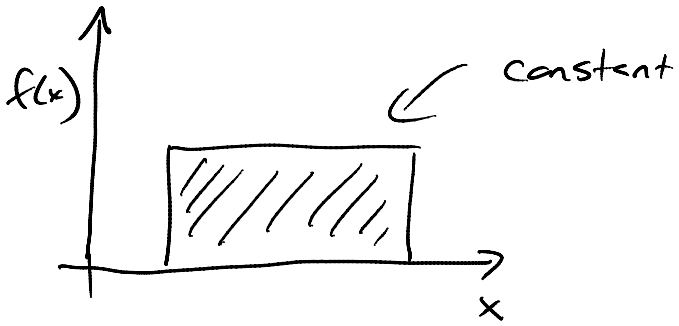

example: Suppose the research department of a steel manufacturer believes that one of the company's rolling machines is producing sheets of steel of varying thickness. The thickness is a uniform random variable with values between 150 and 200 mm. Any sheets less than 160 mm thick must be scrapped because they are unacceptable to buyers.

a) Calculate the fraction of steel sheets produced that need to be scrapped

b) Calculate the mean and standard deviation of the thickness of sheets produced.

c) Using your answers to (b), calculate the probability that a randomly selected sheet will fall within 1 standard deviation from the mean. Also, within 2 std devs of the mean.

a) 

← area under the curve must equal

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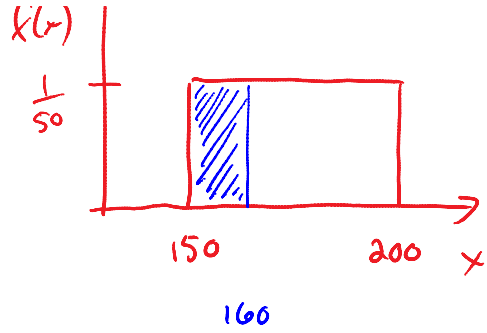

160

← area under the curve must equal 1 so $f(x) = 1/50$ between 150 & 200

$P(\text{being scrapped}) = P(x < 160)$

$= 1/5$ or 20%

b) $\mu = 175$ mm (halfway between 150 & 200)

$$\sigma^2 = \int_{-\infty}^{\infty} x^2 f(x)\,dx - \mu^2$$

$$= \left[\int_{150}^{200} x^2 \frac{1}{50}\,dx\right] - 175^2$$

$$= \frac{x^3}{150}\Big|_{150}^{200} - 175^2$$

$$= 208.\overline{3}$$

$\sigma = 14.4$ mm

$= 14$ mm