Math 136: Calculus 2
Spring 2017
Professor Levandosky
Written Homework 6

1. Evaluate each of the following improper integrals.

   (a) $\displaystyle\int_0^\infty 500xe^{-5x}\,dx$

   (b) $\displaystyle\int_{-\infty}^\infty \frac{400}{(x^2+4)^2}\,dx$

   (c) $\displaystyle\int_0^2 \frac{1}{4-x^2}\,dx$

   (d) $\displaystyle\int_0^2 \frac{1}{\sqrt{4-x^2}}\,dx$

2. Suppose a random variable X has probability density function $p(x) = \dfrac{cx}{(x^2+4)^2}$ for $x \geq 0$ and $p(x) = 0$ for $x < 0$.

   (a) Find c.

   (b) Compute $P(0 \leq X \leq 2)$.

   (c) Find the mean of X.

   (d) Find the median of X.

   (e) Find the standard deviation of X.

3. According to marathonguide.com, the average finishing time in marathons in the U.S. in 2010 was about 4 hours and 35 minutes, with a standard deviation of 1 hour and 2 minutes. Answer the following questions assuming marathon times are normally distributed.

   (a) What proportion of people ran a marathon in under 6 hours?

   (b) What proportion of people ran a marathon in under 5 hours?

   (c) What proportion of people ran a marathon in under 4 hours?

   (d) What proportion of people ran a marathon in under 3 hours?

   (e) What time (in hours and minutes) would someone need to run in order to be in the top 10% (fastest) of marathon times?