Math 488P/588 Homework #8

Reading due: Monday, 3/9/2015, Written assignments due: Thursday, 3/12/2015,

NAME: ______________________________

Reading Assignments - current Status:

Bluman:
skimmed chapter 1
Ch.2: sections 2.1, 2.2, 2.4
Ch.3: sections 3.1, 3.2, 3.3 (the part about standard scores)
all of Ch.4
all of Ch.5
Ch.6: sections 6.1, 6.2

Hossain/Makhnin:
Chapters 1 - 3.5
Chapters 4.1 - 4.3 and 4.6

Reading Assignments: Reading due: Monday, 3/9/2015,

A. Read Bluman Chapters 6.3-6.4: Normal Distribution, Part 2 and chapter 7.1 confidence intervals for the mean when the population standard deviation is known.

B. Read Hossain/Makhnin Chapter 5.

Some chapters in H/M I have skipped and they will be assigned at a later date:
H/M 3.7: Poisson Distribution
H/M 4.4: Exponential distribution
H/M 4.5.1: Poisson process, disregarding the link with the Gamma function

All written assignments below are **due: Thursday, 3/12/2015**,

Assignment 1:

Bluman Problems p.314-316 ch.6.1; (pages were erroneously given as p.309/310)
(just table lookups for the normal distribution)
#9, #13, #18, #29, #35, #44, #49

Solution to assignment 1:
$\#9 \rightarrow .4838, \quad \#13 \rightarrow .0823,$
$\#18 \rightarrow .1909, \quad \#29 \rightarrow .4236,$
$\#35 \rightarrow .9507, \quad \#44 \rightarrow z = 1.98,$
$\#49a)(5\%) \rightarrow z = \pm 1.96, \quad b)(10\%) \rightarrow z = \pm 1.65, \quad c)(1\%) \rightarrow z = \pm 2.58$

Assignment 2:

Look at the following functions $f(x)$. For each one a small number of x-values is given and each one has an unspecified constant k in its definition:

a. $p(x) = (x-2)/k$ for $x = 1, 2, 3, 4, 5$
b. $p(x) = (x^2 - x + 1)/k$ for $x = 1, 2, 3, 4, 5$
c. $p(x) = k/2^x$ for $x = -1, 0, 1, 2$

Can you adjust k in such a manner that $p(x)$ becomes a valid probability mass function? If Yes, compute k. If no, state why this is not possible.

Hint: It is not possible for at least one of the above three questions.

Solution to 2:

Solution to 2a: Cannot make $p(x)$ a pmf because $p(1)$ and $p(3)$ have opposite signs for any choice of $k \neq 0$. Hence $p \geq 0$ cannot be satisfied.

Solution to 2b: First off, it is clear that

$$x^2 - x + 1 \;=\; x^2 - x \;=\; x(x-1) \geq 0 \quad \text{for all } x \geq 1,$$

hence certainly for $x = 1, 2, 3, 4, 5$. It follows that $p(x) \;=\; (x^2 - x + 1)/k \geq 0$ for all $k > 0$. Let

$$h(x) \;=\; x^2 - x + 1 \quad \text{and } k := \; h(1) + h(2) + h(3) + h(4) + h(5).$$

Then

$$\sum_x p(x) \;= p(1) + p(2) + p(3) + p(4) + p(5) \;=\; \frac{h(1) + h(2) + h(3) + h(4) + h(5)}{h(1) + h(2) + h(3) + h(4) + h(5)} \;=\; 1$$

and $p(x)$ is a pmf.

Solution to 2c: Same principle as for 2b: Note that $2^x > 0$ for any integer x. Let

$$h(x) \;=\; 1/2^x \quad \text{and} \;\; k := \; \frac{1}{h(-1) + h(0) + h(1) + h(2)}.$$

Then

$$\sum_x p(x) \;= p(-1) + p(0) + p(1) + p(2) \;=\; \frac{h(-1) + h(0) + h(1) + h(2)}{h(-1) + h(0) + h(1) + h(2)} \;=\; 1$$

and $p(x)$ is a pmf.