Homework 8

Problem #1

6.28 (use *R* for calculations)

6.42

6.43

6.51

Problem #2

1. a. **(+1 bonus pt)** For an arbitrary **continuous** random variable: derive the form of $E[aX + b]$ as a function of a, b and $E[X]$.
   b. Using the results for $E[aX+b]$ and $Var[aX+b]$, proceed to show that for $Z = \frac{X-\mu}{\sigma},\ X \sim N(\mu, \sigma^2)$, we have
      - $E[Z] = 0$,
      - $Var[Z] = 1$.

      Hint: Keeping in mind that μ, σ are **constants**, and X - random variable, represent Z as $aX + b$, where a, b **only contain constants**.
2. For Bernoulli random variable $X \sim Bernoulli(p)$, show that
   a. $E[X] = p$.
   b. $V[X] = p(1-p)$.

Problem #3

Write an *R* function *z.norm* that, for a normally distributed random variable X, calculates the probability of that random variable landing within z standard deviations of its mean. As arguments, the function should take

- z-score value (any positive number)
- *mu* and *sigma* parameters of normal distribution.

Use it to find the probability of X landing within

a. 1.64 standard deviations of the mean.
b. 2.58 standard deviations of the mean equals 0.99.
c. 0.67 standard deviations of the mean.

Would the output in $(a) - (c)$ be affected if you were to change values of *mu* and *sigma* parameters? Why do you think that is? Proceed to demonstrate by running it for another pair of $mu, sigma$ values.