Show **all** of your work on this assignment and answer each question fully in the given context.

Please staple your assignment!

1. **Chapter 5, Section 1, Exercise 6 (page 244)**
2. **Chapter 5, Section 1, Exercise 8 (page 244)**
3. **Chapter 5, Section 2, Exercise 1 (page 263, parts (a), (b), (c), and (e) only)**
4. Consider a continuously distributed random variable, W, with a probability density function given by

$$f(w) = \begin{cases} \frac{1}{5(1-e^{-2})}e^{-w/5} & 0 \leq w \leq 10 \\ 0 & \text{otherwise} \end{cases}$$

   (a) Graph the probability density function (carefully labeling important features).
   (b) Show that the function $f(w)$ is a valid probability density function (i.e., show that (i) $f(w)$ is non-negative and (ii) $\int_{-\infty}^{\infty} f(w)dw = 1$).
   (c) Find $P(W \leq 2)$
   (d) Find $P(2 \leq W \leq 5)$
   (e) Find $P(5 \leq W \leq 10)$
   (f) Find $P(2 \leq W \leq 10)$

5. (*This problem is worth 5 bonus points*) We know that the probability density function of what is known as a normal random variable with $\mathbb{E}(X) = \mu$ and variance σ^2 can be written as

$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{1}{2\sigma^2}(x-\mu)^2}, -\infty < x < \infty$$

   and we also know that, as with any random variable, the integral from $-\infty$ to ∞ of the function $f(x)$ above must be 1:

$$\int_{-\infty}^{\infty} f(x)dx = \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi\sigma^2}}e^{-\frac{1}{2\sigma^2}(x-\mu)^2}dx = 1$$

   for any value we are given for μ or σ^2.

   Using the last fact, to find the value of $\int_{-\infty}^{\infty} e^{3x-x^2}dx$