Instructions: You’re not expected to submit anything for the exercises worth 0 points (although you are expected to do these exercises). For the other exercises, you’re expected to submit enough work to justify your answers, and not merely give the answers.

1) (0 points) Do Exercise 6 on pp. 170 of the text.
2) (0 points) Do Exercise 8 on pp. 170 of the text.
3) (0 points) Do Exercise 9 on pp. 170 of the text.
4) (4 points) Suppose that a logistic regression model is fit in order to predict which survivors of major strokes will suffer another major stroke within the next 60 days. The single predictor $X$ is used, and the estimated coefficients are $\hat{\beta}_0 = -1.11$ and $\hat{\beta}_1 = 0.02$. Suppose that this model was fit using a case-control sample comprised of 50 cases of major stroke survivors who suffered another major stroke within 60 days, and 50 control observations (where the controls were survivors of major strokes who did not suffer another major stroke within 60 days). But now it is desired to make an adjustment so that the fitted model can serve as the basis for a classifier to be applied to a population of major stroke survivors in which it is expected that exactly 10 percent of them will suffer another major stroke within 60 days. If one randomly selected member of this population has the value of 15 for the predictor variable, use the adjusted logistic regression model to estimate the probability that he will suffer another major stroke within 60 days. Report this probability, rounded to the nearest thousandth.

5) Suppose that Type 1 components have life lengths which are exponentially distributed with a mean of 1, and Type 2 components have life lengths which are exponentially distributed with a mean of 2. Suppose that 66 Type 1 and 33 Type 2 components will be put into service at the same time tomorrow. Suppose that when one of these components fail, we’ll know it’s exact life length, but we won’t know if it is a Type 1 or a Type 2 component.
(a) (3 points) Letting $x$ denote the observed life length for a failed component, use the material given on p. 4-13 of the class notes to determine the classification rule for the optimal Bayes classifier, and give that rule. Express the rule in this form:

$$C(x) = \begin{cases} 
1, & \text{if } x \leq x^*, \\
2, & \text{if } x > x^*. 
\end{cases}$$

So, basically your task is to use the material on p. 4-13 of the notes to determine the value of $x^*$ and then give the classification rule in the form indicated above.

(b) (3 points) Given that a component will have a life length of 3.67, what is the probability that it will be a type 2 component? (Again, you can make use of the material on p. 4-13 of the class notes.)