

4.6

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```
options(digits=4)
```

Exercise 4.6

Suppose we collect data for a group of students in a statistics class with variables X_1 = hours studied, X_2 = undergrad GPA, and Y = receive an A. We fit a logistic regression and produce estimated coefficient, $\hat{\beta}_0 = -6$, $\hat{\beta}_1 = 0.05$, $\hat{\beta}_2 = 1$.

Estimate the probability that a student who studies for 40 hrs and has an undergrad GPA of 3.5 gets a A

Set the coefficients

```
x1 <- 40; x2 <- 3.5  
b0 <- -6; b1 <- 0.05; b2 <- 1
```

Use equation (4.2).

```
e <- exp(b0 + b1*x1 + b2*x2)  
e/(1+e)
```

```
## [1] 0.3775
```

The probability that this student gets an A is 0.38.

How many hours would the student in part (a) need to study to have a 50% chance of getting an A?

Using equation (4.2) again, substitute $p(X) = 0.50$ and solve for X_1

```
hours4A <- -(b0+b2*x2)/b1  
hours4A
```

```
## [1] 50
```

Check answer

```
x1 <- hours4A
e <- exp(b0 + b1*x1+b2*x2)
e/(1+e) == .5
```

```
## [1] TRUE
```

So if the student from part (a) studies for 50 hours, they have a 50% chance of getting an A.