Solution

5.1

a.

ortg effect for home games:
$\hat{\pi}_U - \hat{\pi}_L = \frac{e^{1.379+0.119*136.1-0.139*99.5+3.393}}{1+e^{1.379+0.119*136.1-0.139*99.5+3.393}} - \frac{e^{1.379+0.119*108.7-0.139*99.5+3.393}}{1+e^{1.379+0.119*108.7-0.139*99.5+3.393}} = 0.999 - 0.980 = 0.019.$
The probability of winning home games increased by 0.019 over the middle half of the sampled *ortg*.

ortg effect for away games: $\hat{\pi}_U - \hat{\pi}_L = 0.977 - 0.619 = 0.358$.
The probability of winning away games increased by 0.358 over the middle half of the sampled *ortg*.

drtg effect for home games: $\hat{\pi}_L - \hat{\pi}_U = 0.999 - 0.989 = 0.010$.
The probability of winning home games decreased by 0.010 over the middle half of the sampled *drtg*.

drtg effect for away games: $\hat{\pi}_L - \hat{\pi}_U = 0.964 - 0.745 = 0.219$.
The probability of winning away games decreased by 0.219 over the middle half of the sampled *drtg*.

b.

(i) $\hat{\pi}_H - \hat{\pi}_A = 0.996 - 0.901 = 0.095$. The probability of winning home games is 0.095 higher than that of winning away games.
(ii) The odds of winning a home game is $exp(3.393) = 29.755$ times the odds of winning an away game.

5.6

a.

Table 1: Parameter Estimates

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	15.043	7.379	2.039	0.041
Temp	-0.232	0.108	-2.145	0.032

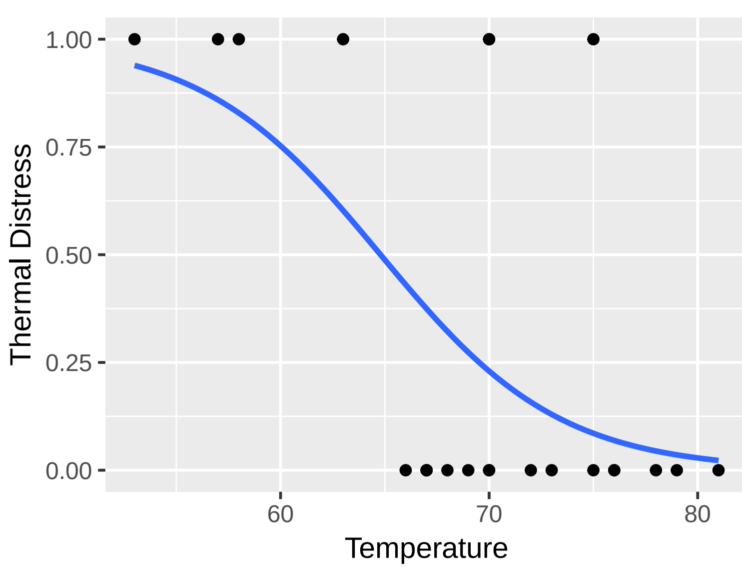

Figure 1: Fitted curve of logistic regression 5.6 (a)

The probability of thermal distress decreases as the temperature increases.

b.

The estimated probability of thermal distress at 31°F is 0.9996.

c.

The Wald 95% confidence interval for β is $-0.232 \pm 1.96(0.108)$, or (-0.444, -0.020). The confidence interval for the effect on the odds of thermal distress per one-unit increase in temperature equals $(e^{-0.444}, e^{-0.020}) = (0.641, 0.980)$.
The p-value for testing $H_0 : \beta = 0$ is 0.0320, so the effect is statistically significant.

5.8

a.

Table 2: Parameter Estimates

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-0.573	0.602	-0.951	0.342
age	0.004	0.006	0.734	0.463

The p-value for testing $H_0 : \beta = 0$ is 0.463, so age does NOT have a significant effect.

b.

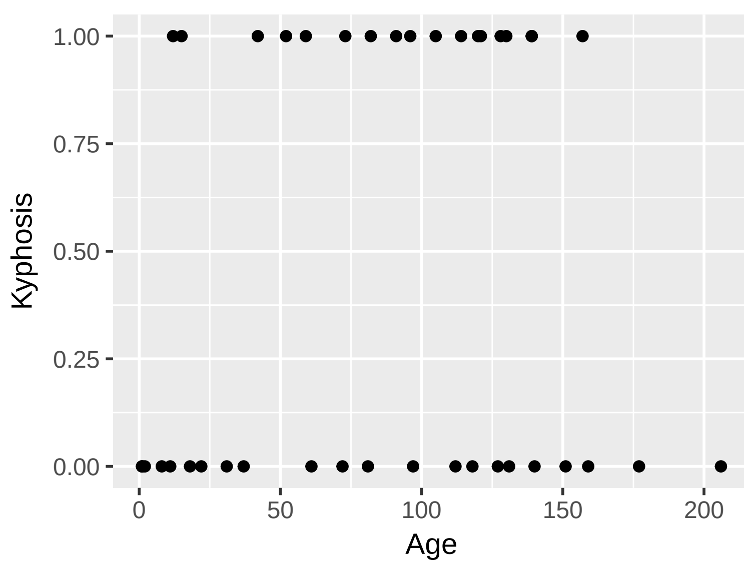

Figure 2: Scatter plot of age and kyphosis

Table 3: Parameter Estimates

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.046	0.994	-2.058	0.040
age	0.060	0.027	2.242	0.025
age.sqr	0.000	0.000	-2.097	0.036

The p-value for testing $H_0 : \beta_2 = 0$ is 0.036, so the squared age term is significant.

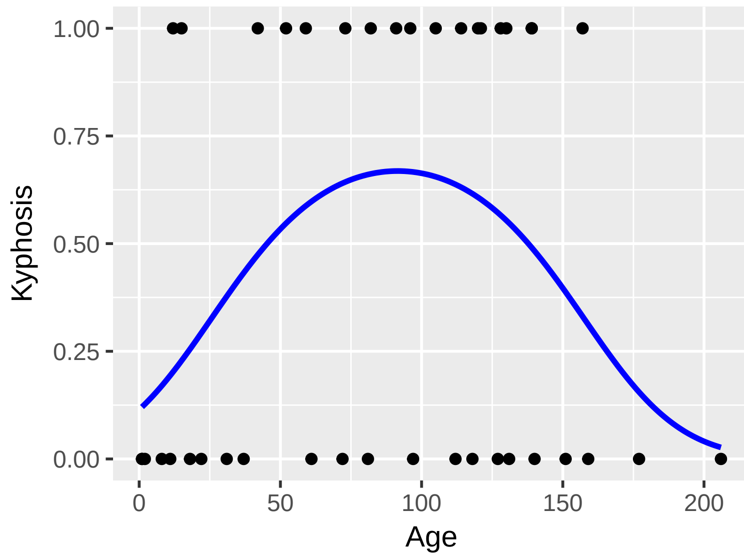

Figure 3: Fitted curve of logistic regression 5.8 (b)

At the very low and very high levels of age, the probability of kyphosis is low. At the middle level of age, the probability of kyphosis is high.