Sec. 2.4 7 The solution is of the form given in the text and it is straightforward to see

$$a_0 = T_1/2,$$

and

$$an = 2T_z \frac{\cos(n\pi) - 1}{n^2\pi^2}$$

Sec 2.5 3

Similarly, we see that

$$u(x,t) = T_0 + \sum_{n=1}^{\infty} \sin(\lambda_n x) \exp(-\lambda_n^2 kt),$$

where $\lambda_n = \frac{(2n-1)\pi}{2a}$ and

$$b_n = \frac{8T(-1)^{n+1}}{\pi^2(2n-1)^2} - \frac{4T_0}{\pi(2n-1)}$$

Sec 2.6 6

$$\begin{aligned}
\int_0^a \sin^2(\lambda_m x)dx &= \int_0^a \frac{1-\cos(2\lambda_m x)}{2} \\
&= \frac{a}{2} - \frac{\sin(2\lambda_m a)}{4\lambda_m} \\
&= \frac{a}{2} - \frac{\sin(\lambda_m a)\cos(\lambda_m a)}{2\lambda_m} \\
&= \frac{a}{2} + \frac{\kappa \cos^2(\lambda_m a)}{2h}
\end{aligned}$$

The last equality follows from

$$\kappa\lambda \cos(\lambda a) + h\sin(\lambda a) = 0$$