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

\[ a_0 = \frac{T_1}{2}, \]

and

\[ a_n = 2T_2 \frac{\cos(n\pi) - 1}{n^2\pi^2} \]

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

\[
\int_0^a \sin^2(\lambda_m x) dx = \int_0^a \frac{1 - \cos(2\lambda_m x)}{2} dx
\]

\[
= a \left( 1 - \frac{\sin(2\lambda_m a)}{2\lambda_m} \right)
\]

\[
= a \left( 1 - \frac{\sin(\lambda_m a) \cos(\lambda_m a)}{2\lambda_m} \right)
\]

\[
= a \left( 1 + \frac{\kappa \cos(\lambda_m a)}{2h} \right)
\]

The last equality follows from

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