2.1.3

$$A q(x,t) + A \Delta x g = A q(x + \Delta x, t) + A \Delta x \rho c \frac{\partial u}{\partial t}$$

According to Newton's law of cooling, the rate of heat-transfer is proportional to exposed area.

$$g = h(v - u(x,t))$$

$$A \Delta x g = C \Delta x h(v - u(x,t))$$

$$\frac{\partial^2 v}{\partial x^2} + \frac{hc}{KA}(v - u(x,t)) = \frac{\rho c}{K}\frac{\partial u}{\partial t}.$$

2.3.6

$$g(x) = \beta x$$

$$b_n = \frac{2}{a}\int_0^a \beta x \sin\left(\frac{n\pi x}{a}\right) dx.$$

$$b_n = \frac{2\beta}{a}\left[-\frac{a^2}{n\pi}(-1)^n\right]$$

$$b_n = \frac{2\beta a}{n\pi}(-1)^{n+1}$$

$$w(x,t) = \sum_{n=1}^{\infty} b_n \sin\left(\frac{n\pi x}{a}\right) \exp\left\{-\frac{n^2\pi^2 k t}{a^2}\right\}$$