

Exercise 5

(a) Use the method of Exercise 4 to solve the Robin problem:

$$\text{DE: } u_t = k u_{xx} \quad \text{on the half-line } 0 < x < \infty \text{ (and } 0 < t < \infty)$$

$$\text{IC: } u(x, 0) = x \quad \text{for } t = 0 \text{ and } 0 < x < \infty$$

$$\text{BC: } u_x(0, t) - h u(0, t) = 0 \quad \text{for } x = 0$$

where h is a constant.

(b) Generalize the method to the case of general initial data $\phi(x)$.