

Exercise 18

Solve the heat equation with convection:

$$u_t - ku_{xx} + Vu_x = 0 \quad \text{for } -\infty < x < \infty \quad \text{with } u(x, 0) = \phi(x),$$

where V is a constant. (*Hint:* Go to a moving frame of reference by substituting $y = x - Vt$.)