

## Exercise 5

The purpose of this exercise is to show that the maximum principle is not true for the equation  $u_t = xu_{xx}$ , which has a variable coefficient.

- (a) Verify that  $u = -2xt - x^2$  is a solution. Find the location of its maximum in the closed rectangle  $\{-2 \leq x \leq 2, 0 \leq t \leq 1\}$ .
- (b) Where precisely does our proof of the maximum principle break down for this equation?