

## Problem Set Two

### Exercises

5.1: **10, 12, 13, 15, 25, 29, 33, 37, 43, 44**

5.2: **2, 3, 15, 19, 27, 30, 32, 49, 53, 55**

5.3: **2, 6, 15, 20, 21, 29, 30, 35**

### Problems

Suppose you are waiting for a cup of coffee to cool. According to Newton's law of cooling, the rate of cooling is proportional to the difference between the temperature of the coffee  $T$  and the temperature of the air  $T_{air}$ .

$$dT/dt = -k(T - T_{air})$$

where  $k$  is a positive constant.

- (a) Using  $dt/dT = 1 / -k(T - T_{air})$ , integrate to find  $t$  as a function of  $T$ .
- (b) Use your answer to part (a) to find  $T$  as a function of  $t$ .
- (c) Should you add the milk right away, or later, so that it cools as fast as possible? Assume that the milk is colder than room temperature, and that it stays in the fridge until you add it.