Lecture 2.6: Mixing problems

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Motivation

Problem statement

Suppose we have a tank of fresh water.

- Salt water flows IN at some (constant) rate.
- The water in the tank is fully mixed.
- Water drains OUT of the tank at the same rate.

Question: What is the concentration of salt in the tank at time t?

An example

Example 1

Suppose we have a tank containing 150 gallons of fresh water.

- Salt water (concentration: 2 oz/gal) flows in at 3 gal/min.
- The water in the tank is fully mixed.
- Water drains from the tank at 3 gal/min.

Question: What is the concentration of salt in the tank at time t?

First step (always!)

Let $x(t) = \#$ ounces of salt in the tank at time t. Then

$$x'(t) = \text{(rate in)} - \text{(rate out)}.$$

Example 1 (cont.)