

Review Solutions (Tank Mixing Problems): Exam 3

12. **Tank Mixing Problems:** Page 117-118, Exercises 5-8. Page 122, Exercise 16.

Exercise 5

$$\begin{aligned}x_1' &= -\frac{2}{25}x_1 + \frac{1}{50}x_2 + 6 \\x_2' &= \frac{2}{25}x_1 - \frac{2}{25}x_2\end{aligned}$$

Exercise 6

$$\begin{aligned}x_1' &= -\frac{3}{50}x_1 + \frac{1}{50}x_2 \\x_2' &= \frac{3}{50}x_1 - \frac{7}{100}x_2 + \frac{1}{100}x_3 \\x_3' &= \frac{1}{20}x_2 - \frac{1}{20}x_3\end{aligned}$$

Exercise 7 (Only the setup- Do not solve the system)

$$\begin{aligned}x_1' &= \frac{3x_2}{100-t} - \frac{2x_1}{100+t}, & x_1(0) = 100, x_2(0) = 50 \\x_2' &= \frac{2x_1}{100+t} - \frac{3x_2}{100-t}\end{aligned}$$

Exercise 8

$$\begin{aligned}x_1' &= -\frac{1}{50}x_2 \\x_2' &= \frac{1}{50}x_1 - \frac{2}{75}x_2 \\x_3' &= \frac{2}{75}x_2 - \frac{1}{25}x_3\end{aligned}$$

Exercise 16, p. 122

$$\begin{aligned}x_1' &= 14 + \frac{1}{100}x_2 - \frac{2}{25}x_1 \\x_2' &= \frac{1}{20}x_1 - \frac{1}{20}x_2\end{aligned}$$