Solutions: Cramer's Rule

1. $$\begin{aligned} C_1 + C_2 &= 2 \\ -2C_1 - 3C_2 &= 3 \end{aligned}$$

   SOLUTION:

$$C_1 = \frac{\begin{vmatrix} 2 & 1 \\ 3 & -3 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ -2 & -3 \end{vmatrix}} = \frac{-9}{-1} = 9 \qquad C_2 = \frac{\begin{vmatrix} 1 & 2 \\ -2 & 3 \end{vmatrix}}{\begin{vmatrix} 1 & 1 \\ -2 & -3 \end{vmatrix}} = \frac{7}{-1} = -7$$

2. $$\begin{aligned} C_1 + C_2 &= y_0 \\ r_1C_1 + r_2C_2 &= v_0 \end{aligned} .$$

   How does the solution depend on r_1, r_2?

   SOLUTION:

$$C_1 = \frac{r_2y_0 - v_0}{r_2 - r_1} \qquad C_2 = \frac{v_0 - r_1y_0}{r_2 - r_1}$$

   The solution exists onlyl when $r_1 \neq r_2$. From the original equations, if $r_1 = r_2$, then it depends on v_0. If $v_0 = y_0$, then the two lines are scalar multiples of each other (so either line would suffice to describe the "infinite number of solutions'. However, if $v_0 \neq y_0$, the two lines are parallel, and we have no solution.

3. $$\begin{aligned} C_1 + C_2 &= 2 \\ 3C_1 + C2 &= 1 \end{aligned}$$

   SOLUTION:

$$C_1 = -\frac{1}{2} \qquad C_2 = \frac{5}{2}$$

4. $$\begin{aligned} 2C_1 - 5C_2 &= 3 \\ 6C1 - 15C_2 &= 10 \end{aligned}$$

   SOLUTION:

   The denominator to Cramer's Rule is zero. The two lines are parallel, so no solution.

5. $$\begin{aligned} 2C_1 - 5C_2 &= 3 \\ 6C1 - 15C_2 &= 9 \end{aligned}$$

   SOLUTION: The denominator to Cramer's rule is zero. In this case there are an infinite number of solutions of the form $2C_1 - 5C_2 = 3$.

6. $$\begin{aligned} 2C_1 - 3C_2 &= -1 \\ 3C_1 - 2C_2 &= 1 \end{aligned}$$

   SOLUTION:

$$C_1 = \frac{1}{5}, \qquad C_2 = \frac{-1}{5}$$