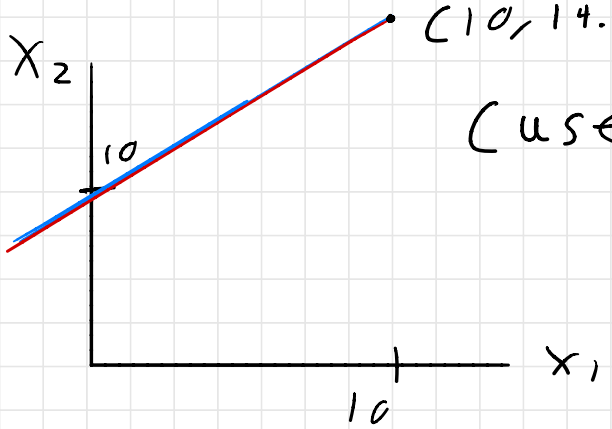
$$0.5x_1 - x_2 = -9.5$$
$$1.02x_1 - 2x_2 = -18.8$$

a) $x_2 = 0.5x_1 + 9.5$

$x_2 = (1.02x_1 + 18.8)/2$

$$\boxed{x_1 = 10, \quad x_2 = 14.5}$$



(used TI-84)

b) $\det \begin{bmatrix} 0.5 & -1 \\ 1.02 & -2 \end{bmatrix}$

$= (0.5 \cdot -2) - (-1 \cdot 1.02)$

$= \boxed{0.02}$

c) The system is ill-conditioned

d) $\left[\begin{array}{cc|c} 0.5 & -1 & -9.5 \\ 1.02 & -2 & -18.8 \end{array}\right]$

$R_2 - \frac{1.02}{0.5} R_1 \rightarrow \left[\begin{array}{cc|c} 0.5 & -1 & -9.5 \\ 0 & 0.04 & 0.58 \end{array}\right]$

$R_1 + \frac{1}{0.04} R_2 \rightarrow \left[\begin{array}{cc|c} 0.5 & 0 & 5 \\ 0 & 0.04 & 0.58 \end{array}\right]$

$0.5 x_1 = 5 \qquad 0.04 x_2 = 0.58$

$x_1 = 10 \qquad x_2 = 14.5$

e) $\left[\begin{array}{cc|c} 0.52 & -1 & -9.5 \\ 1.02 & -2 & -18.8 \end{array}\right]$

$R_2 - \frac{1.02}{0.52} R_1 \rightarrow \left[\begin{array}{cc|c} 0.52 & -1 & -9.5 \\ 0 & \frac{1}{26} & -\frac{43}{200} \end{array}\right]$

$-\frac{1}{26} x_2 = -\frac{43}{260} \rightarrow x_2 = 4.3$

$0.52 x_1 - 4.3 = -9.5$

$0.52 x_1 = -5.2 \rightarrow x_1 = -10$

$x_1 = -10, \quad x_2 = 4.3$