

$$M\ddot{y} = K(x - y) - F\{\dot{y}\}$$

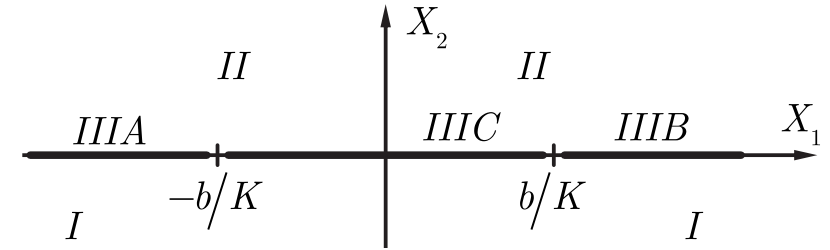
$$\begin{cases} X_1 = x - y \\ X_2 = \dot{y} \end{cases}$$

$$\begin{cases} \dot{X}_1 = v - X_2 \\ \dot{X}_2 = K/M X_1 - F\{X_2\}/M \end{cases}$$

$$\begin{cases} I & X_2 < 0 & F = -a + K_R X_2 \\ II & X_2 > 0 & F = a + K_R X_2 \\ III & X_2 = 0 & \begin{matrix} A & X_1 < -b/K & F = -b \\ B & X_1 > b/K & F = b \\ C & -b/K < X_1 < b/K & F = KX_1 \end{matrix} \end{cases}$$

$$\begin{aligned} \dot{X}_1 &= v - X_2 \\ X_{20} &= v \end{aligned}$$

$$\begin{cases} I & \dot{X}_2 = K/M X_1 - K_R/M X_2 + a/M & X_{10} = \frac{(-a + K_R v)}{K} \\ II & \dot{X}_2 = K/M X_1 - K_R/M X_2 - a/M & X_{10} = \frac{(a + K_R v)}{K} \\ IIIA & \dot{X}_2 = K/M X_1 + b/M & X_{10} = -b/K \\ IIIB & \dot{X}_2 = K/M X_1 - b/M & X_{10} = b/K \\ IIIC & \dot{X}_2 = 0 & X_{10} = \forall X_1 \end{cases}$$



$$a = 1N \quad b = 2N$$

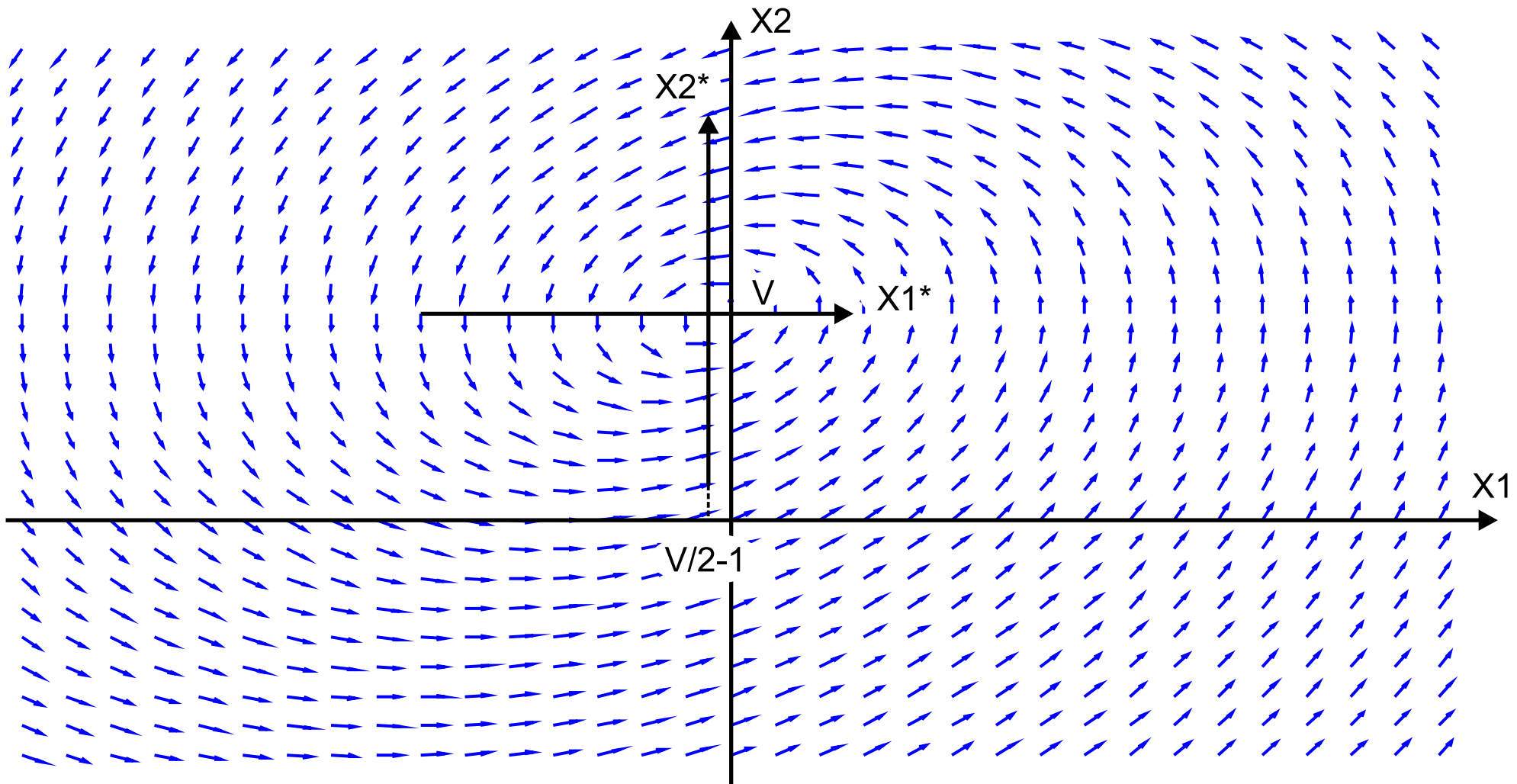
$$K = 1N/m \quad M = 1Kg$$

$$K_R = 0.5Ns/m \quad v = 1.75m/s$$

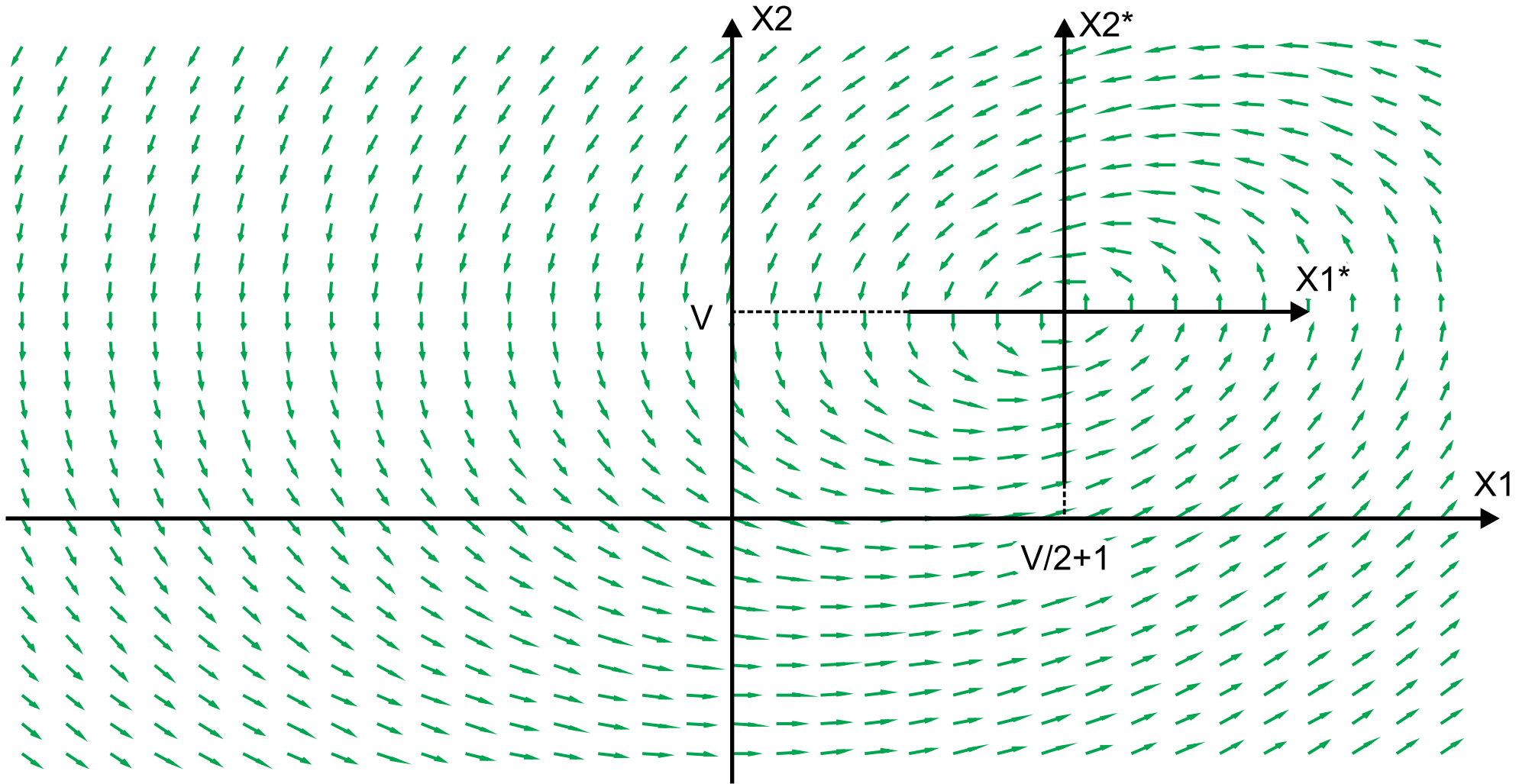
$$\begin{aligned} \dot{X}_1^* &= -X_2^* \\ X_{20} &= v \end{aligned}$$

$$\begin{cases} I & \dot{X}_2^* = X_1^* - \frac{X_2^*}{2} & X_{10} = \frac{v}{2} - 1 = -0.125 \\ II & \dot{X}_2^* = X_1^* - \frac{X_2^*}{2} & X_{10} = \frac{v}{2} + 1 = 1.875 \\ IIIA & \dot{X}_2^* = X_1^* & X_{10} = -2 \\ IIIB & \dot{X}_2^* = X_1^* & X_{10} = 2 \\ IIIC & \dot{X}_2^* = 0 & X_{10} = \forall X_1 \end{cases}$$

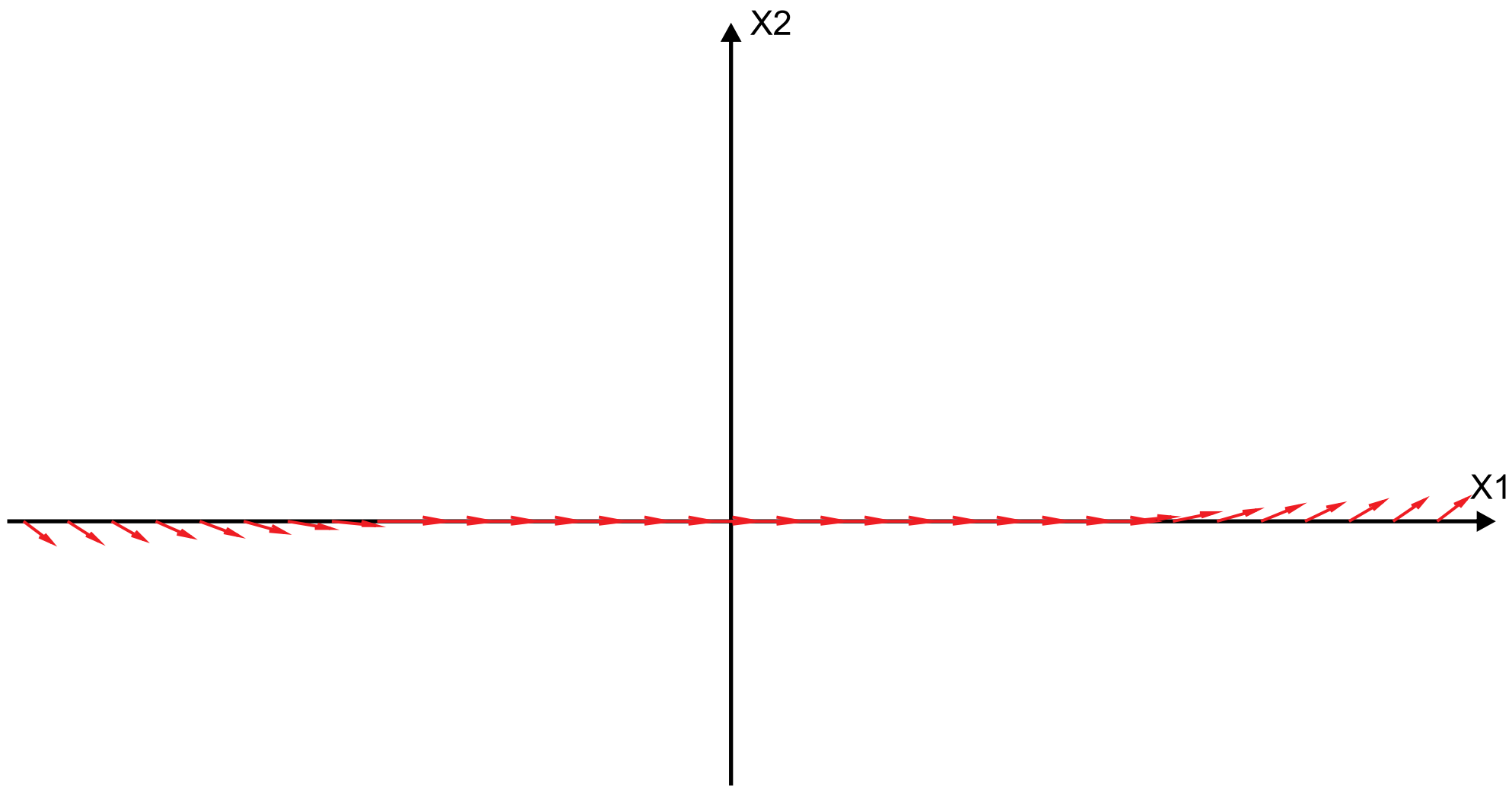
# CASO I ( $X_2 < 0$ )



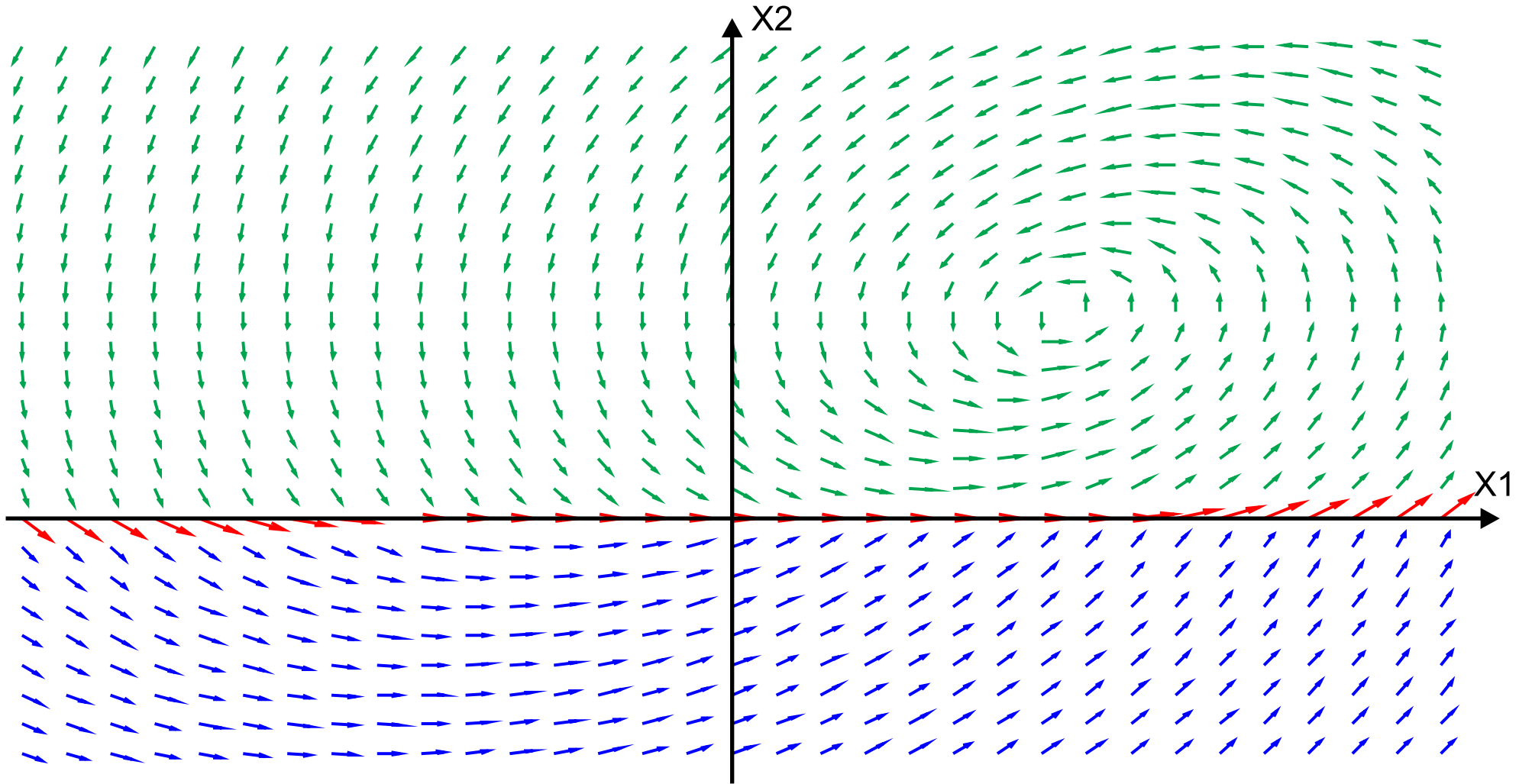
# CASO II ( $X_2 > 0$ )



CASO III ( $X_2=0$ )

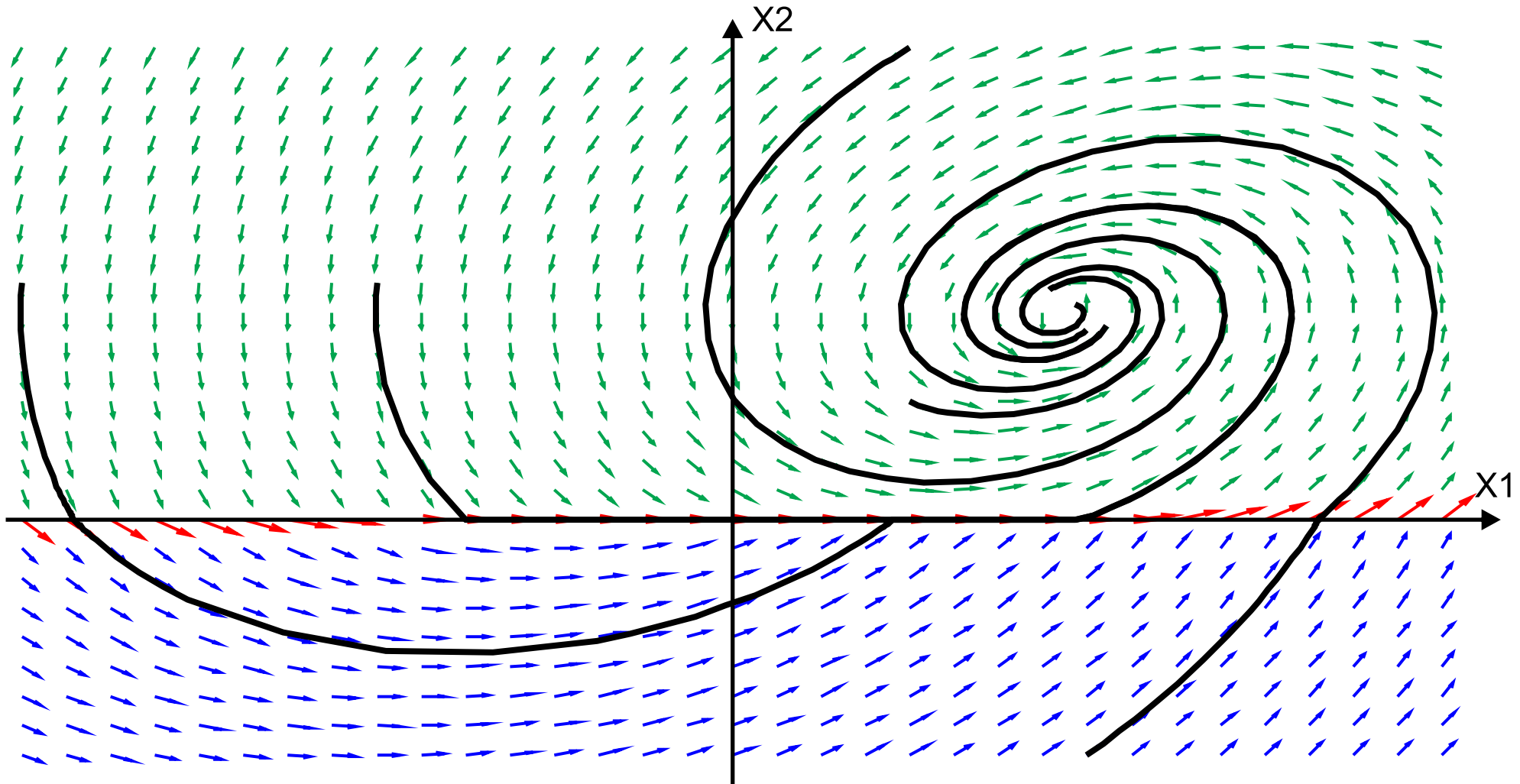


X2: Velocidad del bloque M



X1: Elongación del resorte

X2: Velocidad del bloque M



X1: Elongación del resorte