Use the SIMPLEX Method to find the optimal solution to the following Linear Programming (LP) problem

Minimize $z = 2x_1 + 3x_2$

Subject to:

$3x_1 - 2x_2 \leq 3$

$8x_1 + 4x_2 = 5$

$x_1, x_2 \geq 0$

(12 Marks)

min: $Z = 2X_1 + 3X_2 + 0X_3 + MX_4$

$3X_1 - 2X_2 + X_3 = 3$

$8X_1 + 4X_2 + X_4 = 5$

$A = \begin{bmatrix} 3 & -2 & 1 & 0 \\ 8 & 4 & 0 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$

$C^T = [2 \quad 3]$ $C_0^T = [0 \quad M]$

	X_1	X_2	X_3	X_4	
X_3	0	$-2-\frac{7}{2}$	1	-3	$3\frac{9}{8}$
X_1	1	$\frac{1}{2}$	0	1	$5\frac{5}{8}$
	0	2	0	-2	$-\frac{5}{4}$
	0	0	0	8	0

↑

	x_1	x_2	x_3	
x_3	0	$-\frac{7}{2}$	1	$\frac{9}{8}$
x_1	1	$\frac{1}{2}$	0	$\frac{5}{8}$
	0	2	0	$-\frac{5}{4}$

optimal

$\min = \frac{5}{4}$

$x_1 = \frac{5}{8}$ $x_2 = 0$ $x_3 = \frac{9}{8}$

(b)

$8x_1 + 4x_2 = 5 \Rightarrow x_1 = \frac{5}{8} - 0.5x_2$

$z = 2(\frac{5}{8} - 0.5x_2) + (3+\Delta)x_2 = \frac{5}{4} + (2+\Delta)x_2$

$x_2 \geq 0$ $\quad 2+\Delta \geq 0 \Rightarrow \Delta \geq -2$

(c)

cost coefficient for the artificial variable will be defined as $-M$ with -1 coefficient