FA1 part 1

1. The Primo Insurance Company is introducing two new product lines: special risk insurance and mortgages. The expected profit is $5 per unit on special risk insurance and $2 per unit on mortgages. Management wishes to establish sales quotas for the new product lines to maximize total expected profit. The work requirements are as follows:

Department	Work-Hours per Unit		Work-Hours Available
	Special Risk	Mortgage	
Underwriting	3	2	2400
Administration	0	1	800
Claims	2	0	1200

(a) Formulate a linear programming model for this problem.

(b) Use the graphical method to solve this model.

(c) Verify the exact value of your optimal solution from part (b) by solving algebraically for the simultaneous solution of the relevant two equations

2. Consider the model

$$\text{Minimize} \quad Z = 40x_1 + 50x_2,$$

subject to

$$\begin{aligned} 2x_1 + 3x_2 &\geq 30 \\ x_1 + x_2 &\geq 12 \\ 2x_1 + x_2 &\geq 20 \end{aligned}$$

and

$$x_1 \geq 0, \quad x_2 \geq 0.$$

(a) Use the graphical method to solve this model.

(b) How does the optimal solution change if the objective function is changed to

Z =40x_1 + 70x_2?

(c) How does the optimal solution change if the third functional

constraint is changed to 2x_1 + x_2 >= 15?