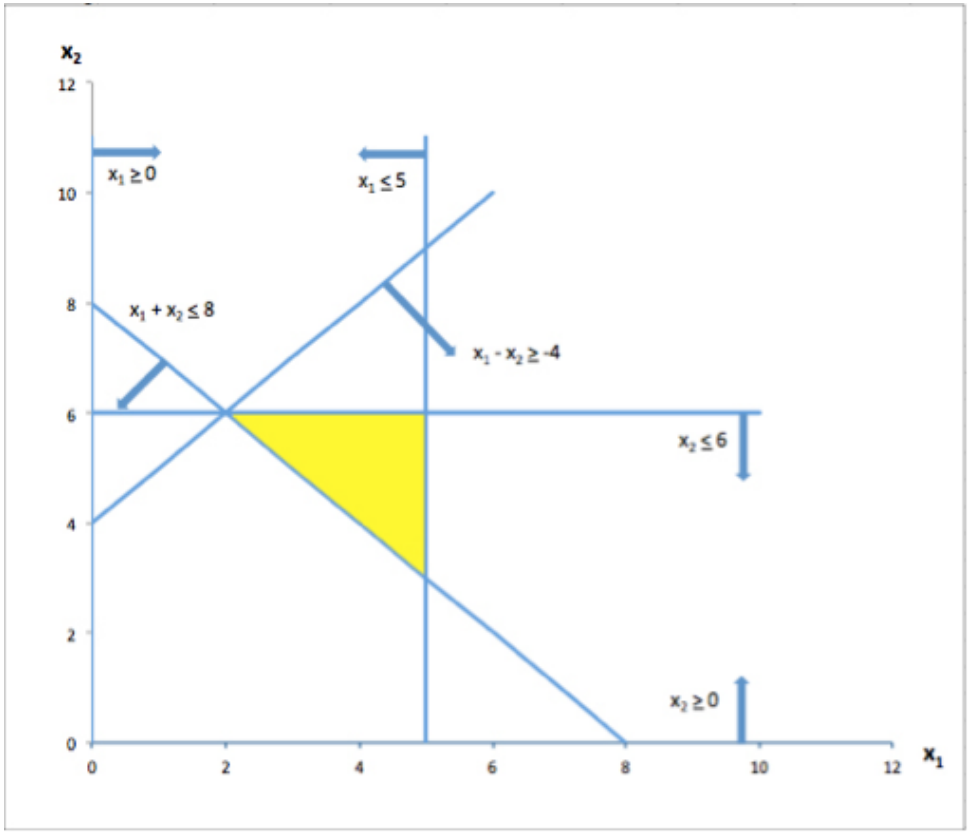
Part A

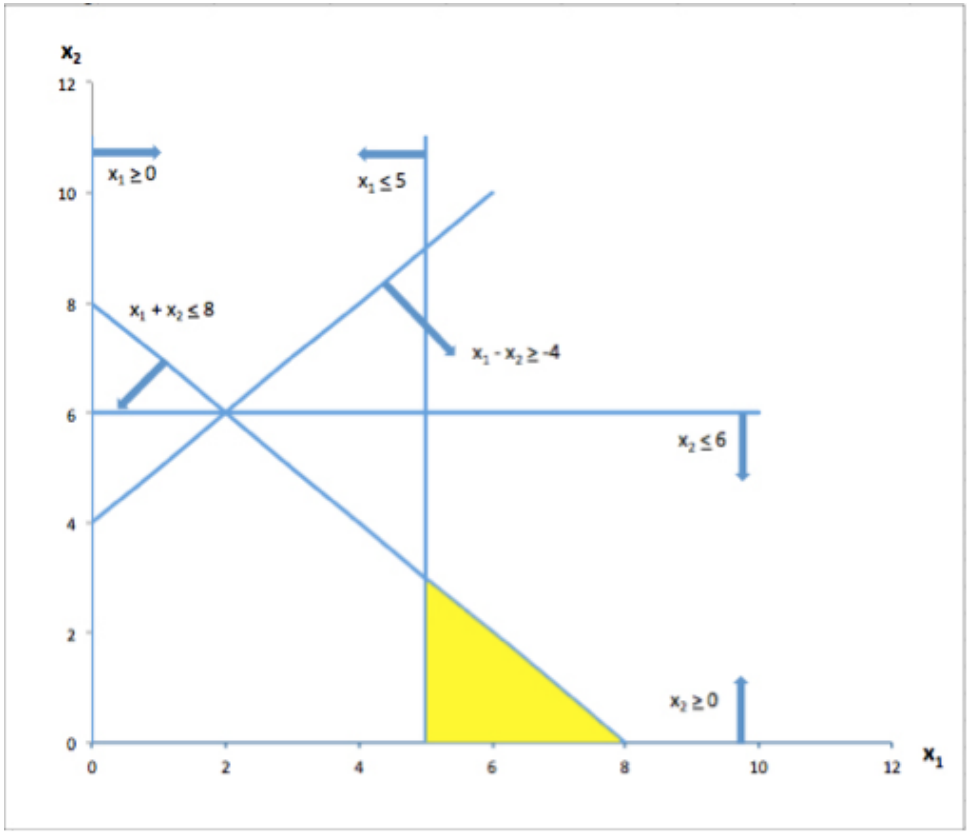
(1/1 point)

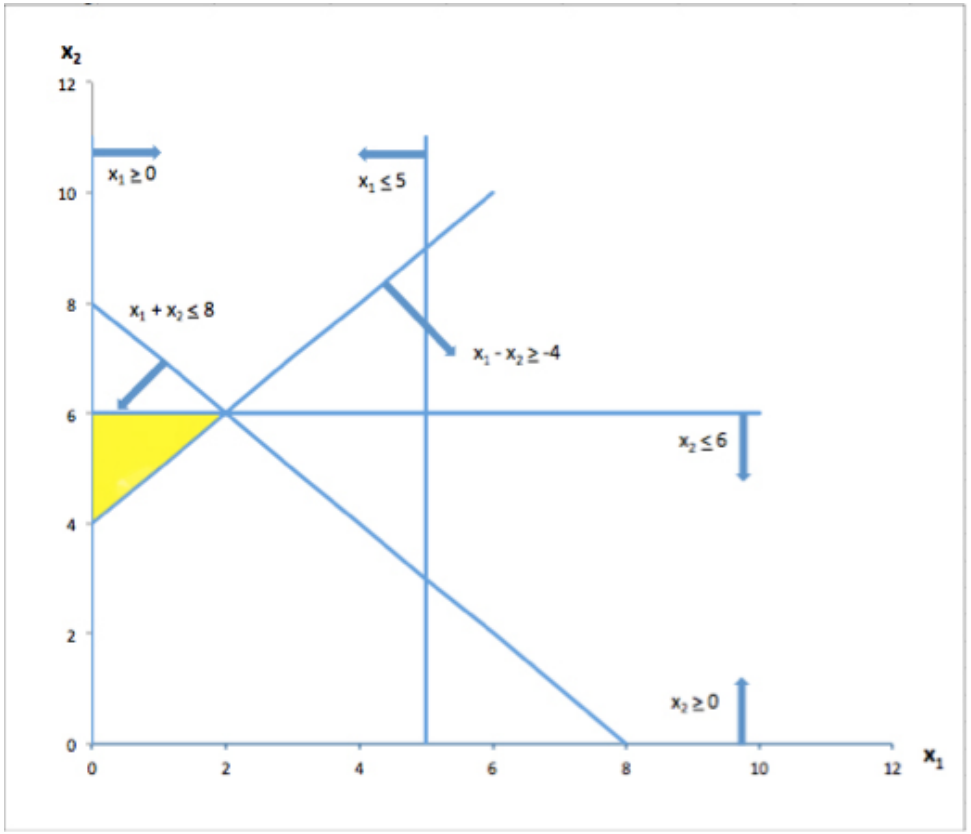
Consider the following linear program:

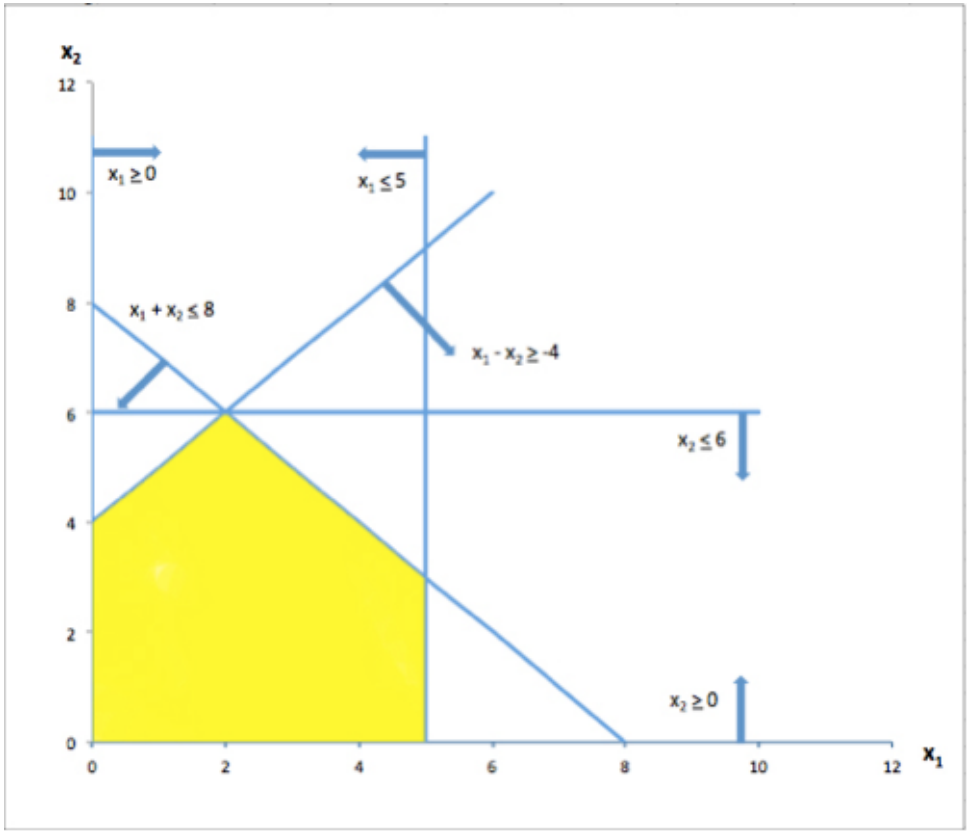
$$\begin{array}{lrcl} \textbf{max} & x_1 + 2x_2 & & \\ \textbf{s.t.:} & & & \\ & x_1 - x_2 & \geq & -4 \\ & x_1 + x_2 & \leq & 8 \\ & x_1 & \leq & 5 \\ & x_2 & \leq & 6 \\ & x_1, x_2 & \geq & 0 \end{array}$$

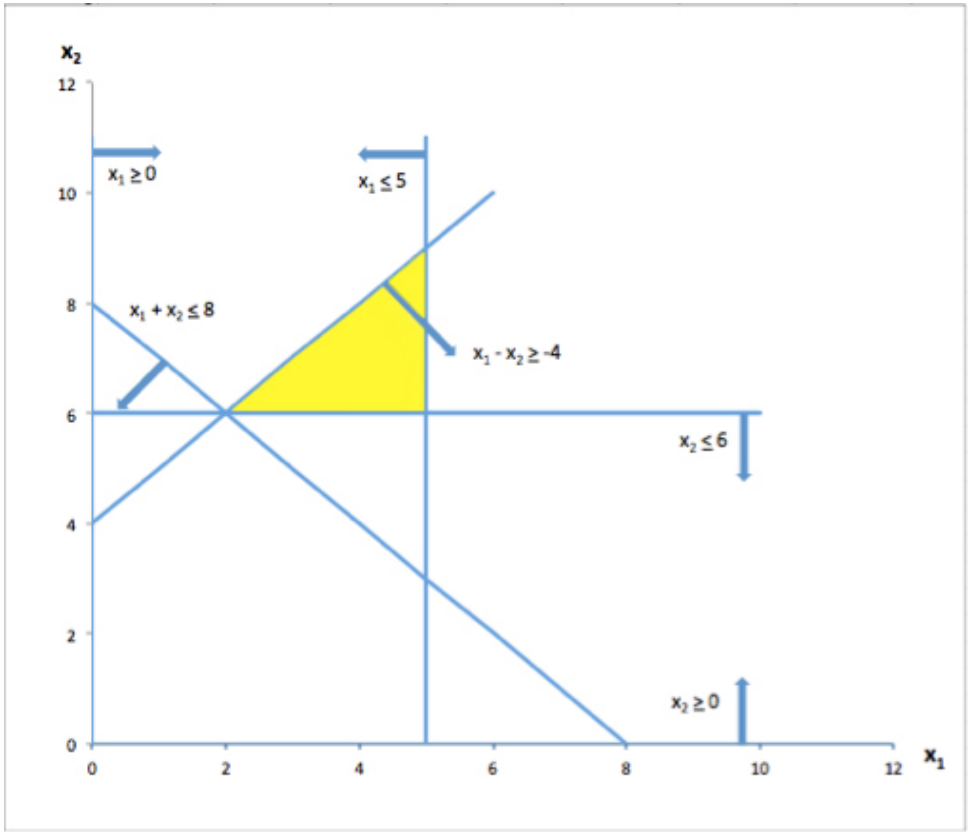
Which of the following graphs shows the feasible region of the LP? The feasible region is indicated by the yellow area.


x2
12
10
8
6
4
2
0
0
2
4
6
8
10
12
x1
x1 ≥ 0
x1 ≤ 5
x1 + x2 ≤ 8
x1 - x2 ≥ -4
x2 ≤ 6
x2 ≥ 0


x_2
12
10
8
6
4
2
0
$x_1 \geq 0$
$x_1 \leq 5$
$x_1 + x_2 \leq 8$
$x_1 - x_2 \geq -4$
$x_2 \leq 6$
$x_2 \geq 0$
0
2
4
6
8
10
12
x_1


x_2
12
10
8
6
4
2
0
$x_1 \geq 0$
$x_1 \leq 5$
$x_1 + x_2 \leq 8$
$x_1 - x_2 \geq -4$
$x_2 \leq 6$
$x_2 \geq 0$
0
2
4
6
8
10
12
x_1


x_2
12
10
8
6
4
2
0
$x_1 \geq 0$
$x_1 \leq 5$
$x_1 + x_2 \leq 8$
$x_1 - x_2 \geq -4$
$x_2 \leq 6$
$x_2 \geq 0$
0
2
4
6
8
10
12
x_1



You have used 1 of 2 submissions

Part B

(3/3 points)

Are any of the above constraints redundant? If so, indicate which one(s). (For large linear programs, eliminating redundant constraints can sometimes speed up the solution of the linear program. Redundant constraints play an even more important role in integer programming.)

- [ ] Constraint 1: $x_1 - x_2 \geq -4$
- [ ] Constraint 2: $x_1 + x_2 \leq 8$
- [ ] Constraint 3: $x_1 \leq 5$
- [x] Constraint 4: $x_2 \leq 6$
- [ ] Constraint 5: $x_1, x_2 \geq 0$
- [ ] None of the above

✔

Note: Make sure you select all of the correct options—there may be more than one!

You have used 1 of 3 submissions

Part C

(1/1 point)

Solve the LP using the graphical method. Input the value $x_1 \times x_2$, the product of the decision variables x_1, x_2, at the optimal solution.

12 ✔

12

You have used 2 of 2 submissions

Part D

(1/1 point)

There is more than one optimal solution.

- True
- False ✔

You have used 1 of 2 submissions

Part E

(1/1 point)

Suppose we add the constraint $3x_1 + 2x_2 \geq \alpha$ to the LP. For which value(s) of α is the constraint redundant?

- $\alpha \in [1.5, \infty)$
- $\alpha \in (-\infty, 1.5]$
- $\alpha \in (-\infty, 0]$ ✔
- $\alpha \in [0, \infty)$
- $\alpha = 0$

You have used 1 of 2 submissions

Part F

(1/1 point)

Given the same constraint in Part E, for which value(s) of α is the optimal solution found above no longer optimal?

- $\alpha \in (12, \infty)$
- $\alpha \in (18, \infty)$ ✔
- $\alpha \in (21, \infty)$

- $\alpha \in (26, \infty)$
- None of the above

You have used 2 of 2 submissions

Part G

(1/1 point)

Replace the objective function $x_1 + 2x_2$ with the objective function $x_1 + \beta x_2$ What is the range of values of β for which the point $(2, 6)$ is optimal?

- $[1, \infty)$ ✔
- $[-1, 1]$
- $[0, 2]$
- $(-\infty, 1]$
- None of the above

You have used 1 of 2 submissions