# MIDTERM 2, Problem 3, Data

In Status column, write either "NOT BINDING" or "BINDING."  All other entries should be numbers.

**Answer Report**

Target Cell (Max)

| Cell | Name | Final Value |
|------|------|-------------|
| $B$18 | Value | 73 |

Adjustable Cells

| Cell | Name | Final Value |
|------|------|-------------|
| $E$8 | x1 | (a) |
| $F$8 | x2 | (b) |
| $G$8 | x3 | 5 |
| $H$8 | x4 | (c) |

Constraints

| Cell | Name | Cell Value | Formula | Status | Slack |
|------|------|-----------|---------|--------|-------|
| $I$13 | #1 LHS | 124 | $I$13<=$K$13 | (d) | (e) |
| $I$14 | #2 LHS | 43 | $I$14<=$K$14 | (f) | (g) |
| $I$15 | #3 LHS | 36 | $I$15<=$K$15 | (h) | (i) |
| $E$8 | x1 | (j) | $E$8>=0 | Binding | (k) |
| $F$8 | x2 | 9 | $F$8>=0 | (l) | (m) |
| $G$8 | x3 | 5 | $G$8>=0 | (n) | (o) |
| $H$8 | x4 | (p) | $H$8>=0 | (q) | (r) |

**Sensitivity Report**

Adjustable Cells

| Cell | Name | Final Value | Reduced Cost | Objective Coefficient | Allowable Increase | Allowable Decrease |
|------|------|-------------|--------------|-----------------------|--------------------|--------------------|
| $E$8 | x1 | (s) | -3.156069364 | 1 | (t) | (u) |
| $F$8 | x2 | (v) | (w) | 2 | 6.24 | 3.275 |
| $G$8 | x3 | 5 | 0 | 3 | 18.71428571 | 6 |
| $H$8 | x4 | (x) | (y) | 4 | 60 | 4.875 |

Constraints

| Cell | Name | Final Value | Shadow Price | Constraint R.H. Side | Allowable Increase | Allowable Decrease |
|------|------|-------------|--------------|----------------------|--------------------|--------------------|
| $I$13 | #1 LHS | (z) | 0.225433526 | (aa) | 249.12 | 133.0769231 |
| $I$14 | #2 LHS | (bb) | 0.757225434 | (cc) | 123.5714286 | 38.925 |
| $I$15 | #3 LHS | (dd) | 0.346820809 | (ee) | (ff) | 86.5 |

# MIDTERM 2, Problem 3, Answer

The complete table from Excel is below.

Explanation:

From the fact that the $x_1$ non-negativity constraint is binding, (a), (j), (k), and (s) are zero.

(t) and (u) follow because $x_1$ is not in the basis.

Because $x_2 = 9$, you can get (b), (l), (m), (v), and (w).

Knowing the value, $x_1$, $x_2$, $x_3$, and the objective function coefficients, you can compute $x_4$, giving you (c), (p), (q), (r), (x), and (y).

Because all three constraints are binding, you get (d)-(i).

(n) and (o) follow because $x_3 > 0$.

(z), (aa), (bb), (cc), (dd), and (ee) follow from the information in the constraints table and complementary slackness.

You do not have enough information to find (ff) (although the value is in the table below).

## Answer Report

Target Cell (Max)

| Cell | Name | Original Value | Final Value |
|------|------|----------------|-------------|
| $B$18 | Value | 73 | 73 |

Adjustable Cells

| Cell | Name | Original Value | Final Value |
|------|------|----------------|-------------|
| $E$8 | x1 | 0 | 0 |
| $F$8 | x2 | 9 | 9 |
| $G$8 | x3 | 5 | 5 |
| $H$8 | x4 | 10 | 10 |

Constraints

| Cell | Name | Cell Value | Formula | Status | Slack |
|------|------|-----------|---------|--------|-------|
| $I$13 | #1 LHS | 124 | $I$13<=$K$13 | Binding | 0 |
| $I$14 | #2 LHS | 43 | $I$14<=$K$14 | Binding | 0 |
| $I$15 | #3 LHS | 36 | $I$15<=$K$15 | Binding | 0 |
| $E$8 | x1 | 0 | $E$8>=0 | Binding | 0 |
| $F$8 | x2 | 9 | $F$8>=0 | Not Binding | 9 |
| $G$8 | x3 | 5 | $G$8>=0 | Not Binding | 5 |
| $H$8 | x4 | 10 | $H$8>=0 | Not Binding | 10 |

## Sensitivity Report

Adjustable Cells

| Cell | Name | Final Value | Reduced Cost | Objective Coefficient | Allowable Increase | Allowable Decrease |
|------|------|-------------|--------------|-----------------------|--------------------|--------------------|
| $E$8 | x1 | 0 | -3.156069364 | 1 | 3.156069364 | 1E+30 |
| $F$8 | x2 | 9 | 0 | 2 | 6.24 | 3.275 |
| $G$8 | x3 | 5 | 0 | 3 | 18.71428571 | 6 |
| $H$8 | x4 | 10 | 0 | 4 | 60 | 4.875 |

Constraints

| Cell | Name | Final Value | Shadow Price | Constraint R.H. Side | Allowable Increase | Allowable Decrease |
|------|------|-------------|--------------|----------------------|--------------------|--------------------|
| $I$13 | #1 LHS | 124 | 0.225433526 | 124 | 249.12 | 133.0769231 |
| $I$14 | #2 LHS | 43 | 0.757225434 | 43 | 123.5714286 | 38.925 |
| $I$15 | #3 LHS | 36 | 0.346820809 | 36 | 1730 | 86.5 |