Note: In this problem set, expressions in green cells match corresponding expressions in the text answers.

```
Clear["Global`*"]
```

1. Maximize $z = f_1[x] = 7\,x_1 + 14\,x_2$ subject to $0 \le x_1 \le 6$, $0 \le x_2 \le 3$, $7\,x_1 + 14\,x_2 \le 84$

```
Maximize[{7 x + 14 y, 7 x + 14 y ≤ 84, 0 ≤ x ≤ 6, 0 ≤ y ≤ 3}, {x, y}]
```

```
{84, {x → 6, y → 3}}
```

3. Maximize the daily output in producting $x_1$ steel sheets by process $P_A$ and $x_2$ steel sheets by process $P_B$ subject to the constraints of labor hours, machine hours, and raw material supply:
$3\,x_1 + 2\,x_2 \le 180$, $4\,x_1 + 6\,x_2 \le 200$, $5\,x_1 + 3\,x_2 \le 160$

```
Maximize[{ x + y, 3 x + 2 y ≤ 180, 4 x + 6 y ≤ 200, 5 x + 3 y ≤ 160}, {x, y}]
```

```
{40, {x → 20, y → 20}}
```

*4. Maximize*
$z = 300\,x_1 + 500\,x_2$ *subject to* $2\,x_1 + 8\,x_2 \le 60$, $2\,x_1 + x_2 \le 30$, $4\,x_1 + 4\,x_2 \le 60$

5. Do problem 4 with the last two constraints interchanged. Comment on the resulting simplication.

The comment in problem 5 goes over my head. I assume the physical layout and maneuverability of the simplex matrix changes if the order of the constraint equations is swapped.

```
Maximize[{ 300 x + 500 y, 2 x + 8 y ≤ 60, 2 x + y ≤ 30, 4 x + 4 y ≤ 60}, {x, y}]
```

```
{5500, {x → 10, y → 5}}
```

But to the Maximize function it matters not at all.

```
Maximize[{ 300 x + 500 y, 2 x + 8 y ≤ 60, 4 x + 4 y ≤ 60, 2 x + y ≤ 30 }, {x, y}]
{5500, {x → 10, y → 5}}
```

7. Maximize $f = 5\,x_1 + 8\,x_2 + 4\,x_3$ subject to $x_j \ge 0$ $(j = 1, \ldots, 5)$ and $x_1 + x_3 + x_5 = 1$, $x_2 + x_3 + x_4 = 1$

```
Clear["Global`*"]
```

```
Maximize[{5 x + 8 y + 4 z, x ≥ 0, y ≥ 0, z ≥ 0,
  w ≥ 0, u ≥ 0, x + z + u == 1, y + z + w == 1}, {x, y, z, w, u}]
```

```
{13, {x → 1, y → 1, z → 0, w → 0, u → 0}}
```

9. Maximize $f = 2 x_1 + 3 x_2 + 2 x_3,\ x_1 \geq 0,\ x_2 \geq 0,\ x_3 \geq 0,\ x_1 + 2 x_2 - 4 x_3 \leq 2,\ x_1 + 2 x_2 + 2 x_3 \leq 5$

```
Maximize[{2 x + 3 y + 2 z, x ≥ 0, y ≥ 0,
  z ≥ 0, x + 2 y + -4 z ≤ 2, x + 2 y + 2 z ≤ 5}, {x, y, z}]
```

$$\left\{9, \left\{x \to 4, y \to 0, z \to \frac{1}{2}\right\}\right\}$$