Homework 12 - Solution

R-26.5
Canonical/Slack Form:

Maximize: $z = x1 + x2$
Subject to: $3x1 + 5x2 + x3 = 77$
$7x1 + 2x2 + x4 = 56$
$x1, x2, x3, x4 \geq 0$ x1, x2 are free; x3, x4 are basic

Maximize: $z = 8 - 5/7x2 + 1/7x4$
Subject to: $29/7x2 + x3 - 3/7x4 = 53$
$x1 + 2/7x2 + 1/7x4 = 8$
$x1, x2, x3, x4 \geq 0$

Maximize: $z = 497/29 + 5/29x3 + 2/29x4$
Subject to: $x2 + 7/29x3 - 3/29x4 = 371/29$
$x1 - 2/29x3 + 5/29x4 = 126/29$
$x1, x2, x3, x4 \geq 0$

The optimal solution value is Z = 497/29, with x1 = 126/29 and x2 = 371/29.

R-26.7
Standard Form:
Maximize: $z = -3y1 - 2y2 - y3$
Subject to: $3y1 - y2 - y3 \leq -1$
$-2y1 - y2 + y3 \leq -2$
$y1, y2, y3 \geq 0$

Canonical/Slack From:
Maximize: $z = -3y1 - 2y2 - y3$
Subject to: $-3y1 + y2 + y3 – y4 + y6 = 1$
$2y1 + y2 - y3 – y5 + y7 = 2$
$y1, y2, y3, y4, y5, y6, y7 \geq 0$ y1, y2, y3 are free; y4, y5, y6, y7 are basic

Maximize: $z = -3 + y1 - 2y2 + y4 + y5$
Subject to: $-3y1 + y2 + y3 – y4 + y6 = 1$
$2y1 + y2 - y3 – y5 + y7 = 2$
$y1, y2, y3, y4, y5, y6, y7 \geq 0$

Maximize: $z = -1 + -5y1 + 2y3 - y4 + y5 + 2y6$
Subject to: $-3y1 + y2 + y3 – y4 + y6 = 1$
$5y1 - 2y3 + y4 – y5 – y6 + y7 = 1$
$y1, y2, y3, y4, y5, y6, y7 \geq 0$

Maximize:	$z = y6 + y7$
Subject to:	$y2 – 1/5y3 – 2/5y4 - 3/5y6 + 2/5y6 + 3/5y7 = 8/5$
	$y1 – 2/5y3 + 1/5y4 – 1/5y5 – 1/5y6 + 1/5y7 = 1/5$
	$y1, y2, y3, y4, y5, y6, y7 \geq 0$

Maximize:	$z = -19/5 + 13/5y3 + 1/5y4 + 9/5y5$
Subject to:	$y2 – 1/5y3 – 2/5y4 - 3/5y5 = 8/5$
	$y1 – 2/5y3 + 1/5y4 – 1/5y5 = 1/5$
	$y1, y2, y3, y4, y5 \geq 0$

The optimal solution value is z = -19/5, with x1 = 1/5, x2 = 8/5 and x3 = 0.

R-26.9
The constraints that bind the feasible region are:

- $x, y \geq 0$
- $x \leq 8$
- $y \leq 9$
- $3x + 5y – 54 \leq 0$