

Answers to some review problems, exam #1

1. $z = 18$, $x_1 = 0$, $x_2 = 8/3$, $x_3 = 16/3$, $x_4 = 14/3$. The equation $z = 18 + 2x_1 + 2u_1 + u_2$ is valid wherever the constraint equations are valid. (Equivalently: $z' = -18 - 2x_1 - 2u_1 - u_2$, where $z' = -z$)
2. (a) $x_1 = 4$, $x_2 = 6$, $z = 206$. (d) The simplex method starts at $(0,0)$, goes to $(0,8)$, then goes to $(4,6)$. (c) The line is $17x_1 + 23x_2 = 206$. (e) $(0,8)$ is degenerate.
3. The final tableau and the new modified tableau are as follows:

	x_1	x_2	u_1	u_2	u_3	u_4	
u_1	0	0	1	-3	1	0	2
x_1	1	0	0	2	-1	0	4
x_2	0	1	0	-1	1	0	6
u_3	0	0	0	1	-3	1	2
	0	0	0	11	6	0	206

	x_1	x_2	u_1	u_2	u_3	u_4	u_5	
u_1	0	0	1	-3	1	0	0	2
x_1	1	0	0	2	-1	0	0	4
x_2	0	1	0	-1	1	0	0	6
u_3	0	0	0	1	-3	1	0	2
u_5	0	0	0	1	-2	0	1	-2
	0	0	0	11	6	0	0	206

One dual simplex pivot on the modified tableau leads to the optimal solution $z_{opt} = 200$, at $(x_1, x_2) = (5, 5)$.

4.

	x_1	x_2	x_3^+	x_3^-	u_1	a_1	a_2	
a_1	1	1	0	0	0	1	0	17
a_2	0	1	1	-1	0	0	1	15
u_1	-1	0	2	-2	1	0	0	0
	-1	-2	-1	1	0	0	0	-32

5. (1) all yes; (2) all no; (3) all no; (4) yes, no, yes, no, no; (5) yes, no, yes, no, no; (6) yes, yes, yes, yes, no.

7.

- (1) c
- (2) d
- (3) b
- (4) d
- (5) e