a.

Manual Simplex Method Tool

	s2	s3	s4	s5	s6	s7	s8	rhs
-	.37373737	.22222222	0	0	0	0	0	27
x2	.03030303	6.9389E-18	0	0	0	0	0	2
s4	.70707071	-1.1111111	1	0	0	0	0	3.5527E-15
s8	.45454545	-6.9389E-17	0	0	0	0	1	15
x1	.07070707	.11111111	0	0	0	0	0	2
x3	.08080808	.11111111	0	0	0	0	0	7
s6	-.34343434	1.1111111	0	0	1	0	0	30
s7	.08080808	.44444444	0	0	0	1	0	24
s5	.1010101	.55555556	0	1	0	0	0	15

Objective function: $z - x_1 - 2x_2 - 3x_3 = 0$, $x_1, x_2, x_3 \geq 0$

max: $x_1 + 2x_2 + 3x_3$

s.t.: $a_1 + a_2 + a_3 + a_4$

new max: $-a_1 - a_2 - a_3 - a_4$

max z: $z = x_1 + 2x_2 + 3x_3$

optimal sol: $x_1 = 2$, $x_2 = 2$, $x_3 = 7$

Max z = 27 feasible

b.

Manual Simplex Method Tool

	s3	s4	s5	s6	s7	s8	s9	rhs
-	0	0	1.3333333	0	1.0833333	1	6.5	3.5
x2	0	0	0	0	.125	0	.25	1.75
s2	0	0	-2	0	-1.625	0	-8.25	38.25
s3	1	0	2	0	.5	0	1.5	22.5
x1	0	0	.33333333	0	.20833333	0	.75	2.25
s1	0	0	-1	0	1.25	0	4.4409E-16	15
s6	0	0	-2	1	-2.25	0	-4.5	4.5
s4	0	1	3	0	2.5	0	7.5	7.5
s4	0	0	-1	0	-.625	-1	-3.75	3.75
x3	0	0	0	0	0	0	.5	.5

Objective function: $z - x_1 - 2x_2 - 3x_3 = 0$, $x_1, x_2, x_3 \geq 0$

max: $x_1 + 2x_2 + 3x_3$

s.t.: $a_1 + a_2 + a_3 + a_4$

new max: $-a_1 - a_2 - a_3 - a_4$

max z: $z = x_1 + 2x_2 + 3x_3$

* Solution is infeasible because artificial variables are still present.

c.

Manual Simplex Method Tool

	x1	x2	x3	s1	s2	s3	s4	rhs
-	0	0	0	0	-.5	.75	-1.3333333	10
x2	0	1	0	0	-.08333333	.20833333	-.16666667	2
x3	0	0	1	0	-.16666667	.16666667	-.33333333	1
x1	1	0	0	0	.16666667	-.16666667	1.6653E-16	3
s1	0	0	0	1	-1.25	1.875	-1.5	9.3259E-15

Objective function: $z - x_1 - 2x_2 - 3x_3 = 0$, $x_1, x_2, x_3 \geq 0$

max: $x_1 + 2x_2 + 3x_3$

s.t.: $a_1 + a_2 + a_3 + a_4$

new max: $-a_1 - a_2 - a_3 - a_4$

max z: $z = x_1 + 2x_2 + 3x_3$

* Solution is infeasible because artificial variables except s1 are negative