Solve the following LPPs using the Simplex method:

23. Maximise $z = 3x_1 + 2x_2$

subject to $x_1 + x_2 \le 4$

$x_1 - x_2 \le 2$

and $x_1, x_2 \ge 0$

Answer: $x_1 = 3, x_2 = 1$
Maximum $z = 11$

24. Maximise $z = 3x_1 + 2x_2 + 5x_3$

subject to $x_1 + 2x_2 + x_3 \le 430$

$3x_1 + 2x_3 \le 460$

$x_1 + 4x_2 \le 420$

and $x_1, x_2, x_3 \ge 0$

Answer: $x_1 = 0, x_2 = 100, x_3 = 230$
Maximum $z = 1350$

25. Maximise $z = 4x_1 + 5x_2 + 9x_3 + 11x_4$

subject to $x_1 + x_2 + x_3 + x_4 \le 15$

$7x_1 + 5x_2 + 3x_3 + 2x_4 \le 120$

$3x_1 + 5x_2 + 10x_3 + 15x_4 \le 100$

and $x_1, x_2, x_3, x_4 \ge 0$

Answer: $x_1 = 50/7, x_2 = 0 = x_4, x_3 = 55/7$
Maximum $z = 695/7$

26. Maximise $z = x_1 + x_2 + x_3$

subject to $4x_1 + 5x_2 + 3x_3 \le 15$

$10x_1 + 7x_2 + x_3 \le 12$

and $x_1, x_2, x_3 \ge 0$

Answer: $x_1 = 0 = x_2, x_3 = 5$
Maximum $z = 5$

27. Maximise $z = x_1 + x_2 + 3x_3$

subject to $3x_1 + 2x_2 + x_3 \le 3$

$2x_1 + x_2 + 2x_3 \le 2$

and $x_1, x_2, x_3 \ge 0$

Answer: $x_1 = 0 = x_2, x_3 = 1$
Maximum $z = 3$

28. Maximise $z = 4x_1 + 3x_2 + 6x_3$

subject to $2x_1 + 3x_2 + 2x_3 \le 440$

$4x_1 + 3x_3 \le 470$

$2x_1 + 5x_2 \le 430$

and $x_1, x_2, x_3 \ge 0$

Answer: $x_1 = 0, x_2 = 380/9, x_3 = 470/3$
Maximum $z = 3200/3$

29. Minimise $z = -x_1 + 2x_2$

subject to $-x_1 + 3x_2 \le 10$

$x_1 + x_2 \le 6$

$x_1 - x_2 \le 2$

and $x_1, x_2 \ge 0$

Answer: $x_1 = 2, x_2 = 0$
Minimum $z = -2$

30. Minimise $z = x_1 - 3x_2 + 3x_3$

subject to $3x_1 - x_2 + 2x_3 \le 7$

$2x_1 + 4x_2 \ge -12$

$-4x_1 + 3x_2 + 8x_3 \le 10$

and $x_1, x_2, x_3 \ge 0$

Answer: $x_1 = 31/5, x_2 = 58/5, x_3 = 0$
Minimum $z = -143/5$