

Graphical Optimization

Example 1 Find (x_1, x_2) in order to maximize $f(x_1, x_2) = 400x_1 + 600x_2$, subject to

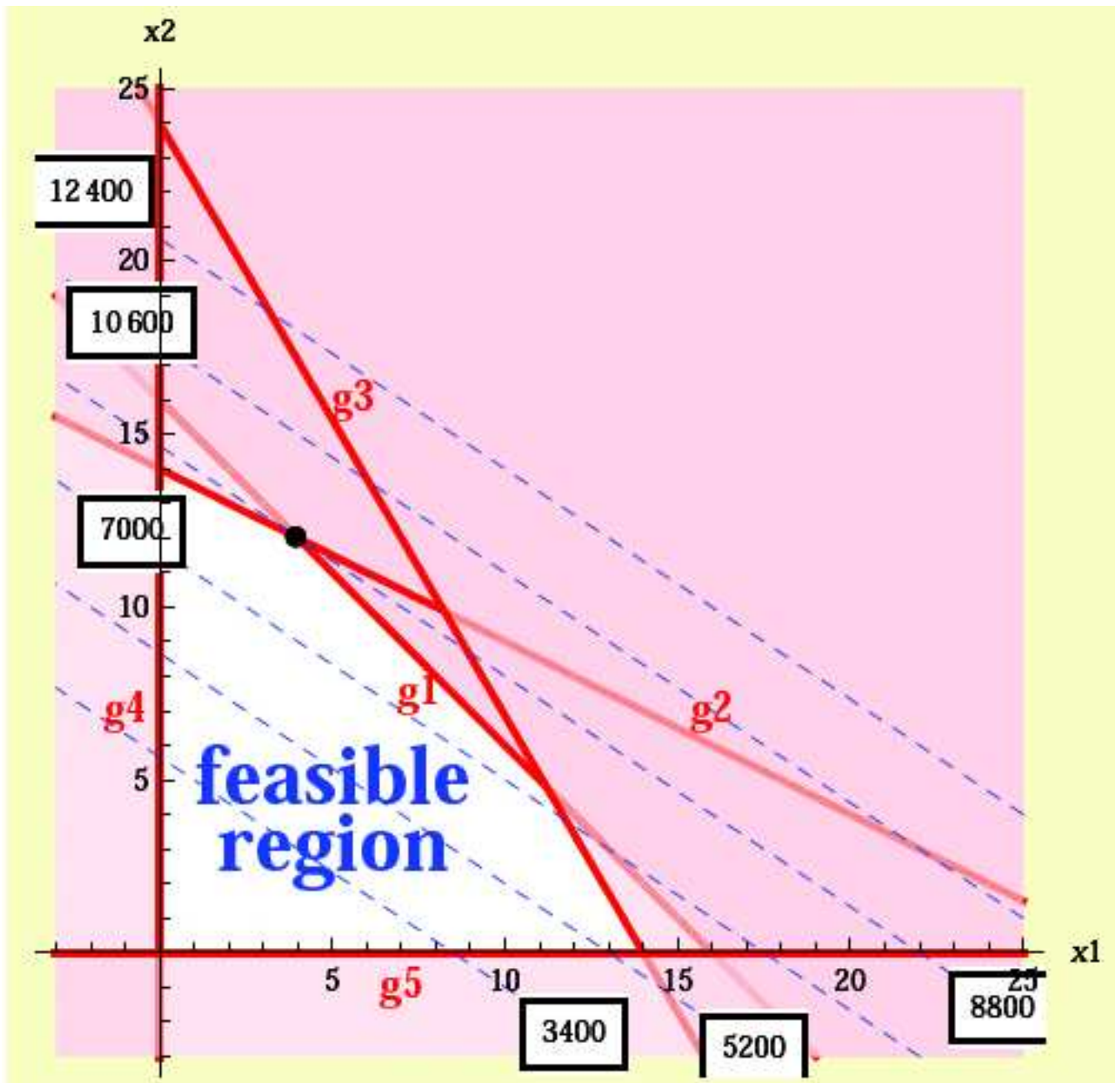
$$g_1 : x_1 + x_2 \leq 16$$

$$g_2 : \frac{x_1}{28} + \frac{x_2}{14} \leq 1$$

$$g_3 : \frac{x_1}{14} + \frac{x_2}{24} \leq 1$$

$$g_4 : x_1 \geq 0$$

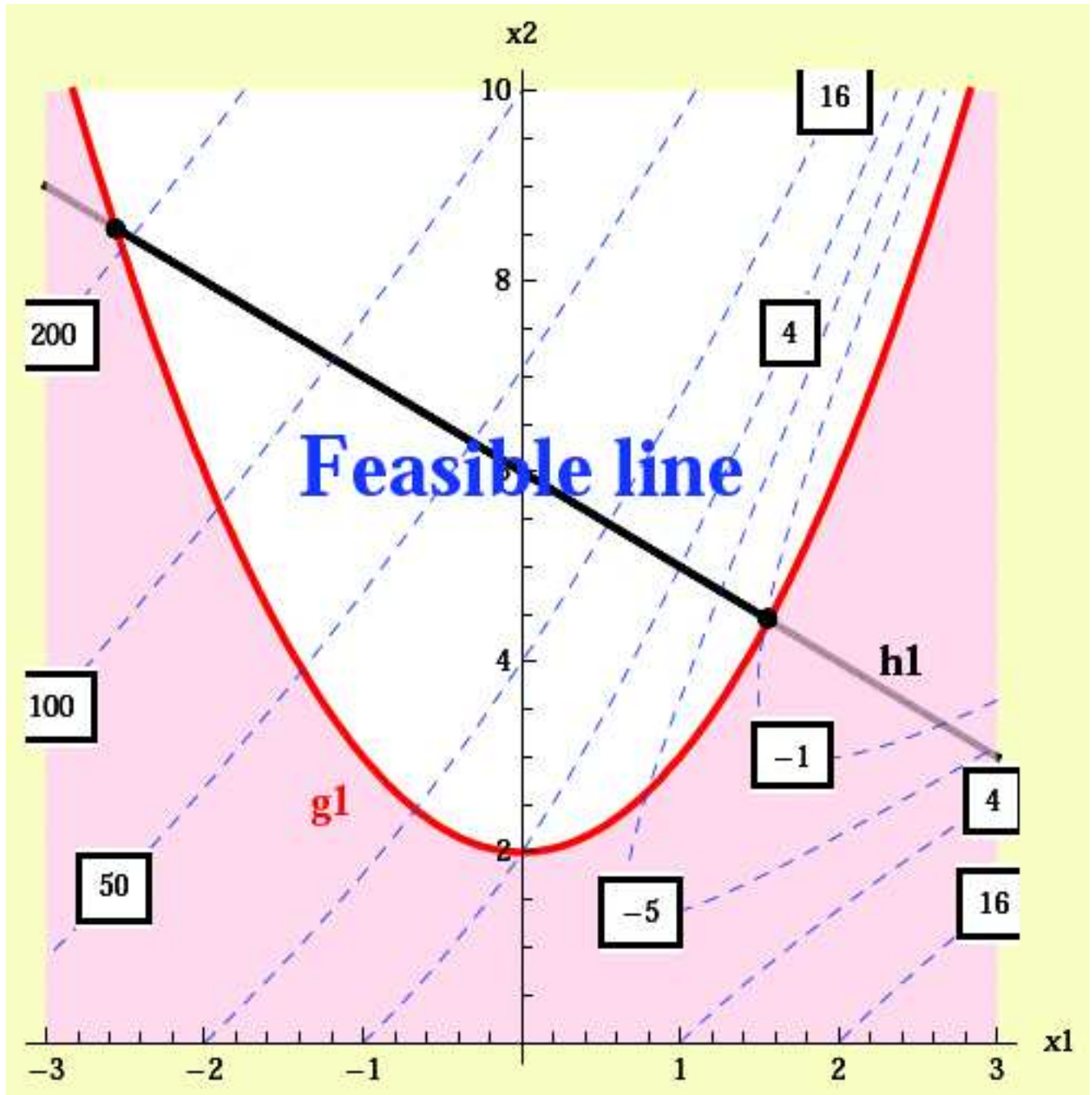
$$g_5 : x_2 \geq 0$$



Example 2 Find (x_1, x_2) in order to minimize $f(x_1, x_2) = 4x_1^2 - 5x_1x_2 + x_2^2$, subject to

$$g_1 : x_1^2 - x_2 + 2 \leq 0$$

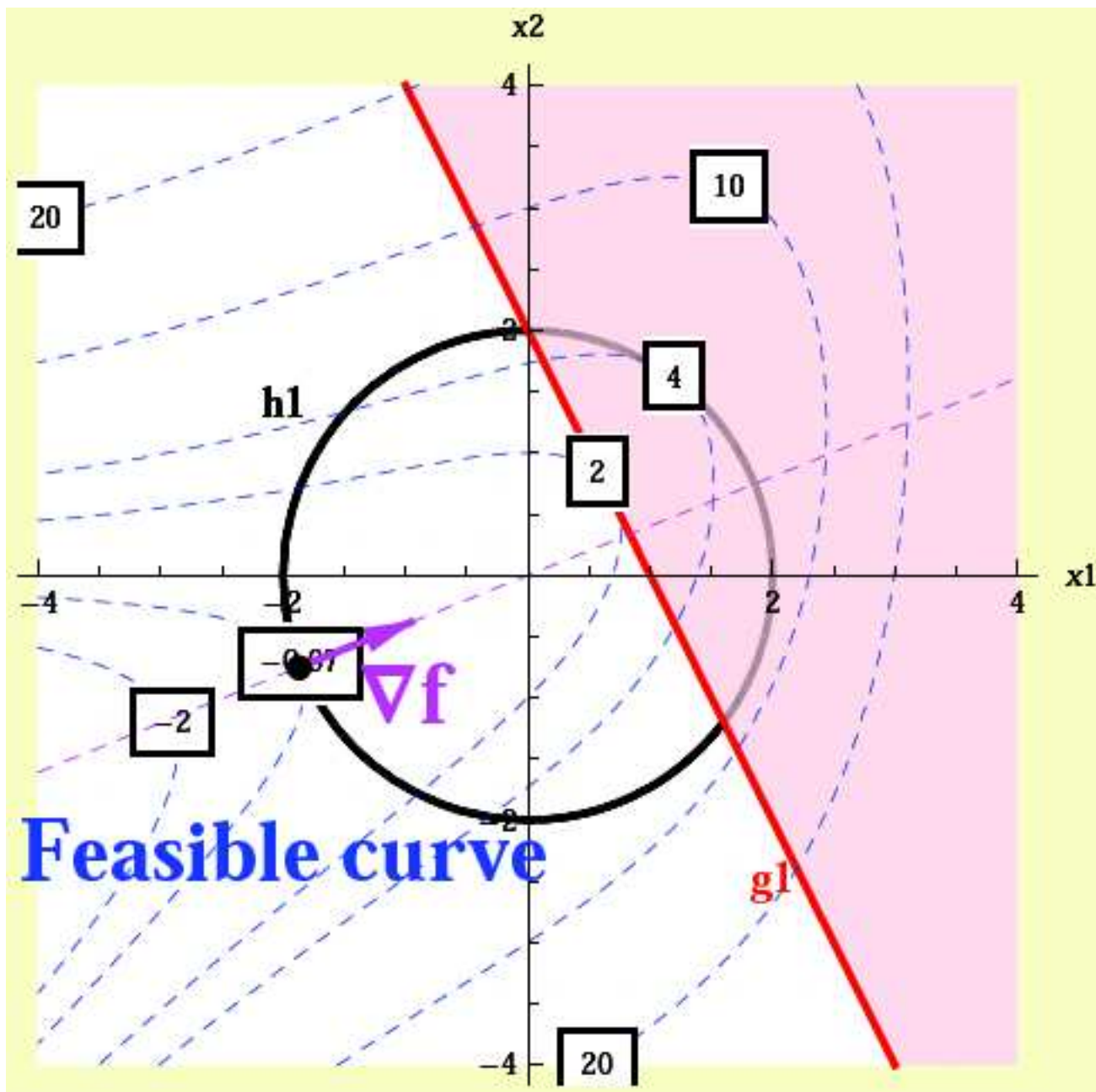
$$h_1 : x_1 + x_2 = 6$$



Example 3 Find (x_1, x_2) in order to minimize $f(x_1, x_2) = e^{x_1} - x_1x_2 + x_2^2$, subject to

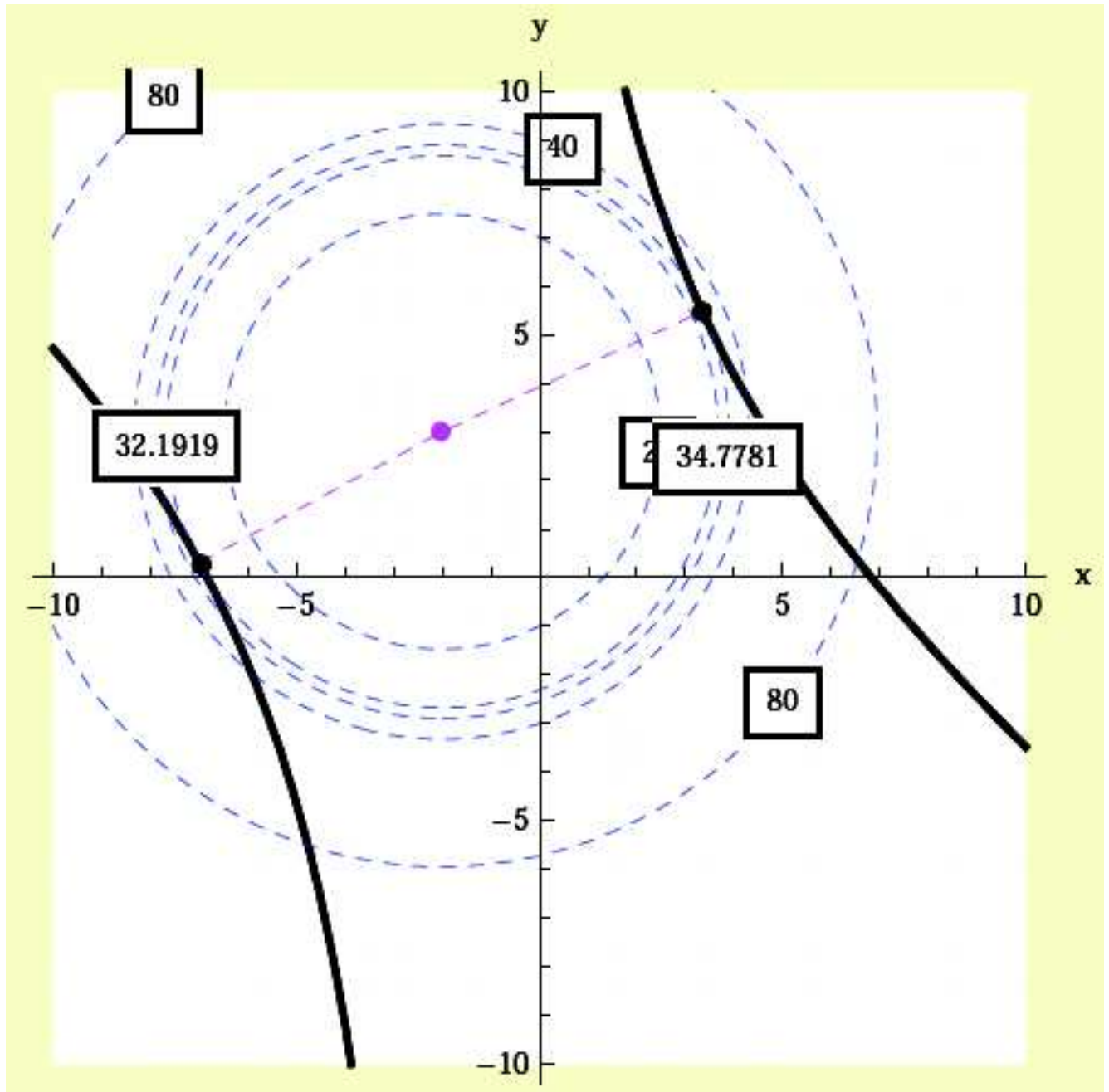
$$g_1 : 2x_1 + x_2 \leq 2$$

$$h_1 : x_1^2 + x_2^2 = 4$$



Example 4 (disjoint feasible region) Find (x, y) in order to minimize $f(x, y) = (x + 2)^2 + (y - 3)^2$, subject to

$$g : 3x^2 + 4xy + 6y = 140$$



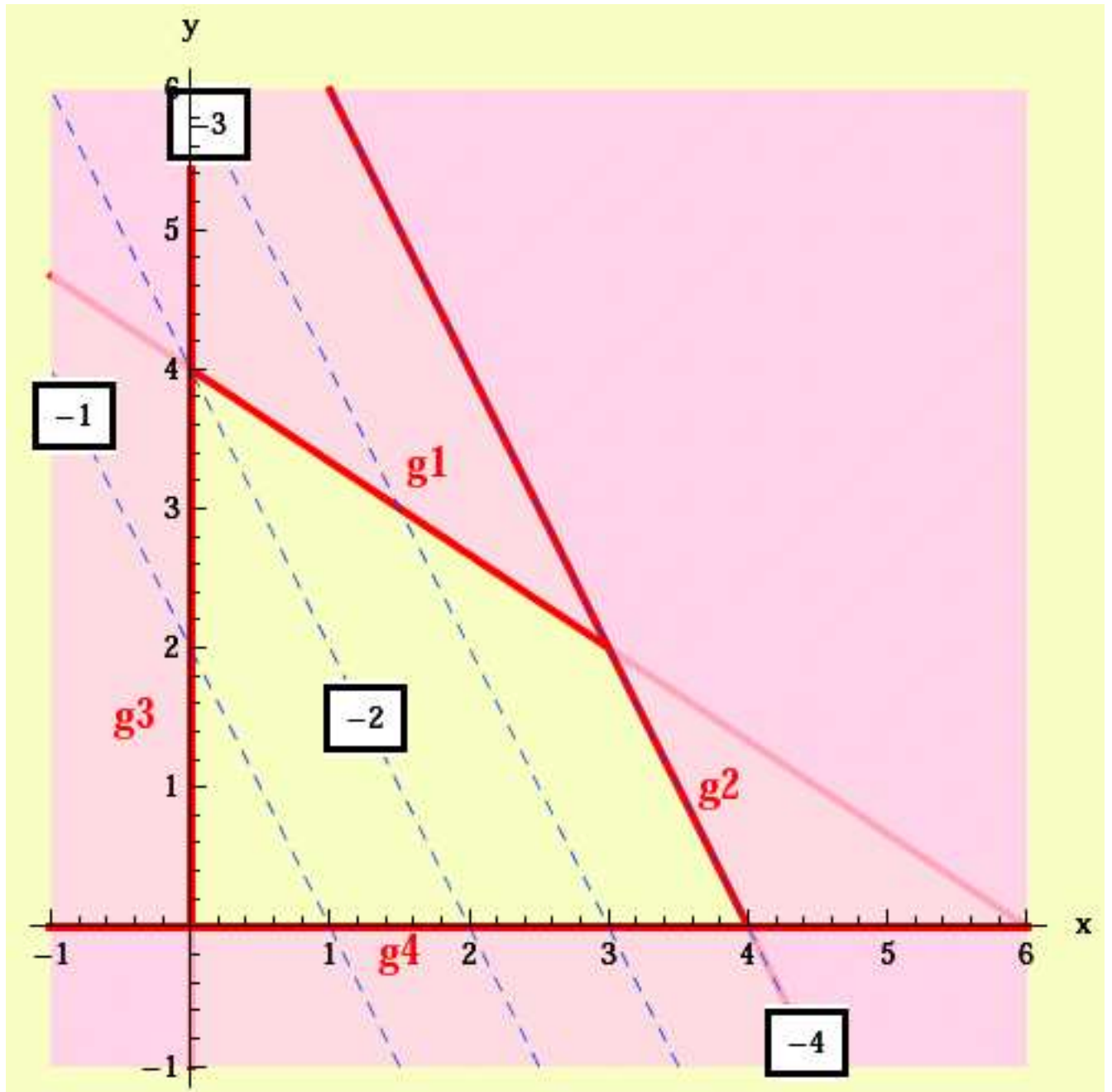
Example 5 (problem with multiple solutions) Find (x, y) in order to minimize $f(x, y) = -x - 0.5y$, subject to

$$g_1 : 2x + 3y \leq 12$$

$$g_2 : 2x + y \leq 8$$

$$g_3 : x \geq 0$$

$$g_4 : y \geq 0$$



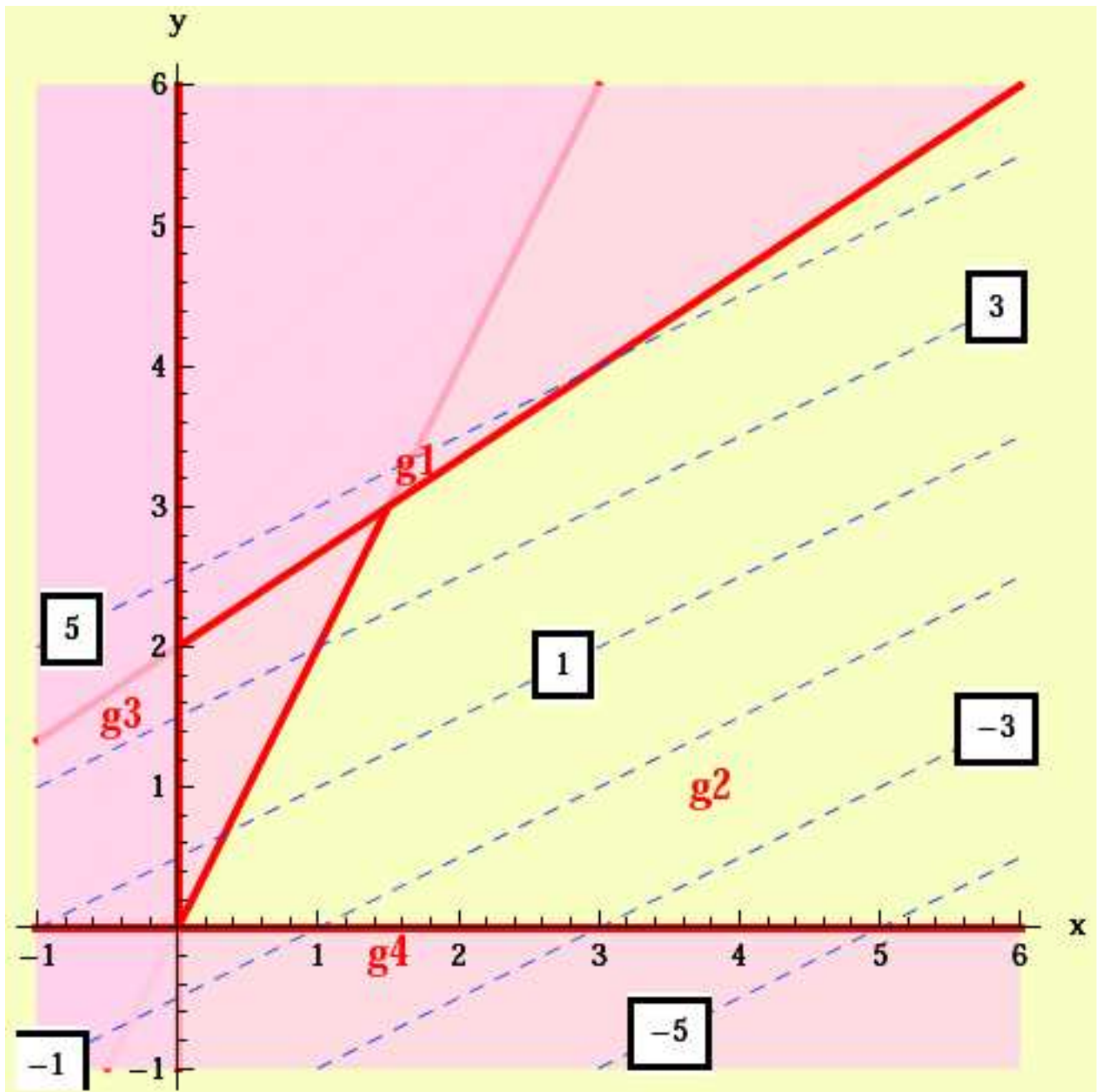
Example 6 (problem with unbounded solutions) Find (x, y) in order to minimize $f(x, y) = -x + 2y$, subject to

$$g_1 : -2x + y \leq 0$$

$$g_2 : -2x + 3y \leq 6$$

$$g_3 : x \geq 0$$

$$g_4 : y \geq 0$$



Example 7 (infeasible problem) Find (x, y) in order to minimize $f(x, y) = x + 2y$, subject to

$$g_1: 3x + 2y \leq 6$$

$$g_2: 2x + 3y \geq 12$$

$$g_3: x \geq 0$$

$$g_4: y \geq 0$$

$$g_5: y \leq 4$$

