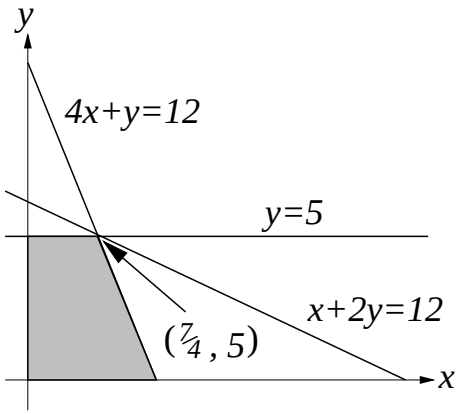
**Applications of Partial Differentiation**
***Extremes within restricted domains***

**Question**
$Q(x, y) = 2x + 3y$
Maximize $Q$, subject to

$$\begin{aligned} x &\geq 0 \\ y &\geq 0 \\ y &\leq 5 \\ x + 2y &\leq 12 \\ 4x + y &\leq 12 \end{aligned}$$

**Answer**
Maximize $Q(x, y) = 2x + 3y$, in the region of constraint pictured below.




Notice that if a point satisfies $y \leq 5$ and $4x + y \leq 12$ then it also satisfies $x + 2y \leq 12$.
$y = 5$ and $4x + y = 12$ meet at $\left(\frac{7}{4}, 5\right)$, and so the maximum value of $Q(x, y)$ under the constraints is

$$Q\left(\frac{7}{4}, 5\right) = \frac{7}{2} + 15 = \frac{37}{2}.$$