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Linear programming, and our steps for finding maxima and minima, are applicable in a number of kinds of applied optimization problems. As we practice these problems, we will see that setting them up accurately can be more difficult than solving the mathematics problem which arises, which for bounded regions is pretty straightforward given the steps we outlined last lecture.

Example 1. *You want to invest up to \$10,000 in the stock market. Dorf shares sell for \$50 each, yield a dividend of 5% and have a risk index of 2.0 each.*

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The mathematics of investments and finance can become highly complicated.

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As stated when we gave the steps for solving linear programming problems, if the feasibility region is unbounded we need to check the values of the objective function at boundary points which "go to infinity". More formally, we systematically approximate the unbounded feasibility region by bounded feasibility regions which grow to fill the original (as is best seen in a picture).

Example 2. *Find the maxima and minima, if they exist, of the function* $F(x,y) = 2x + 4y$ *over the constraint region* $\begin{cases} x + y \geq 2 \\ y \geq 0 \\ -x + 2y \leq 4 \end{cases}$. *Repeat the problem for the function* $F(x,y) = 4x + 4y$.

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Example 3. *Suppose that in a production facility the proportion of two components is never allowed to be more than 2 to 1, so they are always ordered together in less than 2 to 1 proportions to one another.*

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