

## 5.5-Applied Max/Min Problems

Goal: To optimize a practical value subject to certain restrictions (often given geometrically)

*Examples:*

A farmer has 1200 feet of fencing to enclose a field bordered by a river on one side. If no fence is needed along the river, find the dimensions of the field which give the largest area.

A rectangular beam is to be cut from a cylindrical log of radius 25 cm. Find the dimensions which maximize the area of the rectangular cross-section of the beam.

Suppose the strength of the beam in the previous example is proportional to the product of its width and the square of its depth. Find the dimensions of the strongest beam that can be cut from the log.

Find the shortest distance from the point  $(3, 7)$  to the line  $y = 2x$ .

If a projectile is fired from the ground at an angle  $\theta$  with initial speed  $v_0$ , the position of the projectile is given by  $\mathbf{r}(t) = \langle (v_0 \cos \theta)t, -\frac{1}{2}gt^2 + (v_0 \sin \theta)t \rangle$ . Find the angle which maximizes the horizontal range of the projectile.