

Topic: Optimization

- (Priority Mail Package) Postal regulations specify that a parcel sent by priority mail may have a combined length and girth of no more than 108 in. Find the dimensions of a rectangular package that has a square cross section and largest volume that may be sent by priority mail. What is the volume of such a package? (The length plus the girth is $L + 4x$, where L is the length and x is the side length of the square cross section.)
- (Another Priority Mail Package) If the cross section of the rectangular box does not have to be a square, but the length of the box has to be 40 inches. What is the largest volume that the package can have?
- (Yet Another priority Mail Package) To ship a cylindrical package by priority mail, what is the largest possible volume of the package?

- A production editor at Weston Publishers decided that the pages of a book should have a 1 in. margin at the top and the bottom, and a $1/2$ in. margin on each side of the page. She further stipulated that each page of the book should have an area of 50 in^2 . Determine the dimensions of the page that will result in the maximum printed area on the page.

- Find the points on the line $y = x^2$ that are closest to the point $(0, 1)$.

- A rectangle is to be inscribed in a semicircle of radius 2. What is the largest area the rectangle can have, and what are its dimensions?
- If exactly 200 people sign up for a charter flight, the operators of a charter airline charge \$300 for a round-trip ticket. However, if more than 200 people sign up for the flight, then each fare is reduced by \$1 for each additional person. Assuming that more than 200 people sign up, determine how many passengers will result in a maximum revenue for the travel agency. What is the maximum revenue? What would the fare per person be in this case?
- Two cars approach each other, each traveling at a speed of 50 miles per hour. Their paths are straight lines that intersect at an angle of 90° . At a certain instant of time, one car is 20 mi from the point of intersection of their paths, while the other is 30 mi from it. At what time will the cars be closest to each other, and what will that distance be?