

AB Calculus Optimization Day 3 Homework

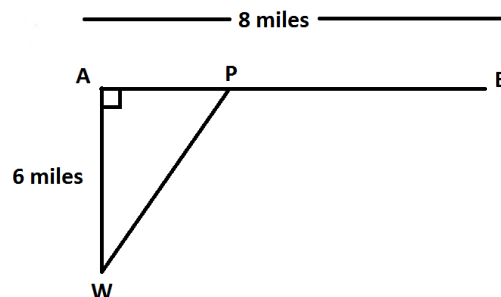
Name: _____

1. Find two positive numbers such that the sum of the first and twice the second is 100 and their product is a maximum.

2. If 40 passengers hire a special car on a train, they will be charged \$8 each. This fare will be reduced by \$0.10 for each passenger, if the number of passengers is over 40. What number of passengers will produce the most revenue for the railroad?

3. An athletic field is to be built in the shape of a rectangle x units long capped by semicircular regions of radius r at the two ends. The field is to be bounded by a 400-m running track. What values of x and r will give the rectangle the largest possible area?

4. An offshore well is located in the ocean at a point W which is six miles from the closest shore point A on a straight shoreline. The oil is to be piped to a shore point B that is eight miles from A by piping it on a straight line under water from W to some shore point P between A and B and then on to B via a pipe along the shoreline. If the cost of laying pipe is \$100,000 per mile underwater and \$75,000 per mile over land, how far from A should the point P be located to minimize the cost of laying the pipe? What will the cost be?



5. A function f is continuous on the closed interval $[-3, 3]$ such that $f(-3) = 4$ and $f(3) = 1$. The functions f' and f'' have the properties given in the table below.

x	$-3 < x < -1$	$x = -1$	$-1 < x < 1$	$x = 1$	$1 < x < 3$
$f'(x)$	positive	does not exist	negative	0	negative
$f''(x)$	positive	does not exist	positive	0	negative

- a) What are the x -coordinates of all relative maximum and minimum points of f on the interval $(-3, 3)$? Justify your answer.
- b) What are the x -coordinates of all points of inflection of f on the interval $[-3, 3]$? Justify your answer.
- c) For what values of x is the graph concave down? Justify your answer.
- d) On the axes provided, sketch a graph that satisfies the given conditions of f . Answers may vary slightly.

