

# AP Calculus AB - Optimization - Test

Common Core AP CALC AB 5.10, AP CALC AB 5.11 · [maths-pdf.fr/en/](https://maths-pdf.fr/en/)

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_

This test checks optimization problems with fences, boxes, cans, closest points and revenue, including justifying a maximum or minimum (AP Calculus AB, 5.10, 5.11). It has 8 questions worth 20 points in total. Allow 45 minutes, work without notes, and show all work, since justification earns points on the AP exam.

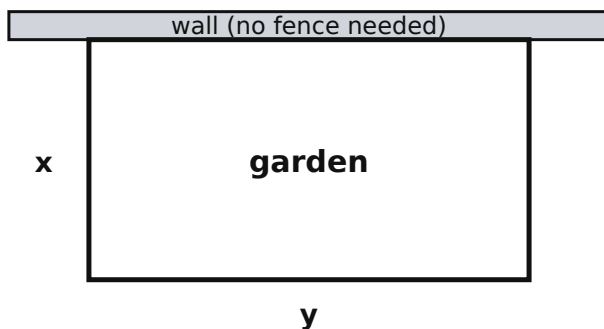
## About this test

- Grade: AP Calculus AB
- Chapter: Optimization
- Standards: AP CALC AB 5.10, AP CALC AB 5.11
- Time: 45 minutes
- Total: 20 points

## Question 1 - Maximum product [2 pts]

Two numbers add to 30. Find the numbers whose product is largest.

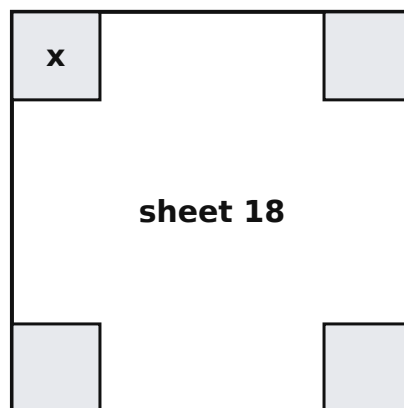
## Question 2 - Pen against a wall [3 pts]



Pen against a wall; 80 ft of fence.

A rancher has 80 ft of fence for a rectangular pen against a wall (three sides need fence). Find the dimensions that maximize the area and state the maximum area.

### Question 3 - Open box [3 pts]



cut a square of side  $x$  from each corner, then fold up

An 18-inch square sheet.

An open box is made from an 18-in square sheet by cutting squares of side  $x$  from the corners. Find  $x$  that gives the greatest volume and that volume.

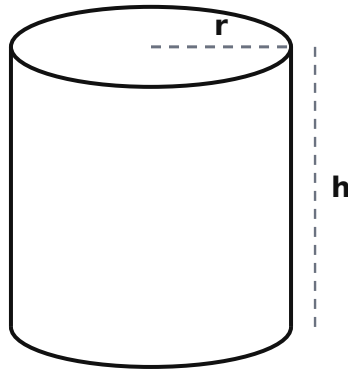
### Question 4 - Closest point [2 pts]

Find the point on the line  $y = x + 3$  that is closest to the origin.

### Question 5 - Revenue [3 pts]

A hat stand sells  $q = 300 - 6p$  hats per week at price  $p$  dollars. (a) Write the revenue function. (1 point) (b) Find the price that maximizes revenue. (1 point) (c) Justify and give the maximum revenue. (1 point)

### Question 6 - Can design [3 pts]



A can holding  $1000 \text{ cm}^3$ .

A closed can must hold  $1000 \text{ cm}^3$ . Find the radius that minimizes the surface area, and show that it is a minimum. (Round to two decimals.)

**Question 7 - Justifying an extremum [2 pts]**

For the function  $A(x) = x(60 - 2x)$  on  $0 < x < 30$ , show that the critical number gives an absolute maximum using the First Derivative Test.

**Question 8 - Ticket price [2 pts]**

A concert sells 400 tickets at  $\$20$ . Each  $\$2$  increase sells 20 fewer tickets. What price gives the greatest revenue?