

## Pre-Test 1

Maths IB<sub>2</sub> AA

subjects : *First Principle & rules of derivation*

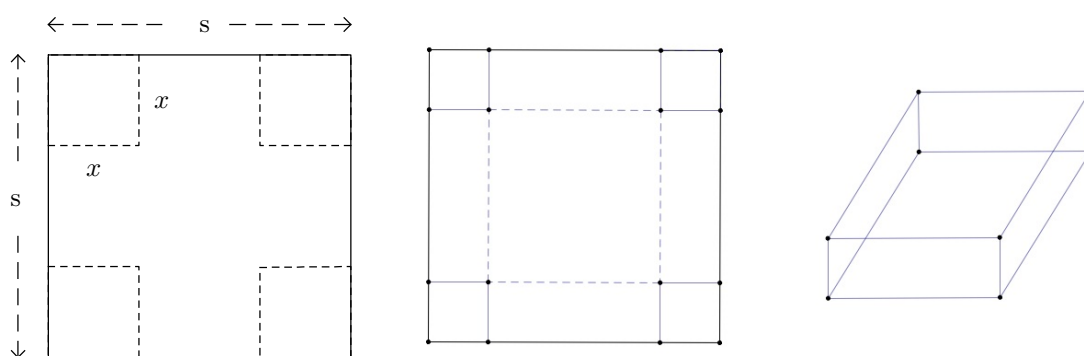
November 4 2024

Tot : [ / 26 marks]

### Question 1

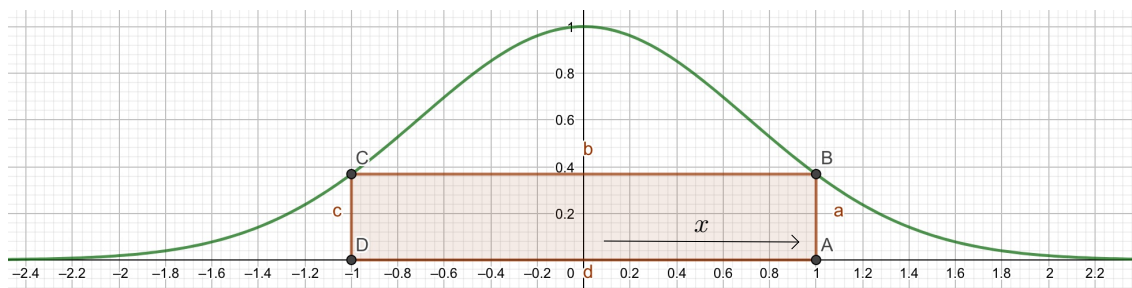
Find the maximal volume we can get using a square surface of side  $s$  (for exaple  $s = 2$ )

by cutting the four corners on a length  $x$ , vefore folding the douir sides as shown :



### Question 2

Find  $x$  such that the area of the figure ABCD is maximal



### Question 3

Points A and P lie on opposite banks of a river, such that AP is the shortest distance across the river. Point B represents the centre of a city which is located on the riverbank.  $PB = 215 \text{ km}$ ,  $AP = 65 \text{ km}$  and  $\angle APB = 90^\circ$ .

The following diagram shows this information.



A boat travels at an average speed of  $42 \text{ km h}^{-1}$ . A bus travels along the straight road between P and B at an average speed of  $84 \text{ km h}^{-1}$ .

- (a) Find the travel time, in hours, from A to B given that
- (i) the boat is taken from A to P, and the bus from P to B;
  - (ii) the boat travels directly to B.
- [4]

There is a point D, which lies on the road from P to B, such that  $BD = x \text{ km}$ . The boat travels from A to D, and the bus travels from D to B.

- (b) (i) Find an expression, in terms of  $x$  for the travel time  $T$ , from A to B, passing through D.
- (ii) Find the value of  $x$  so that  $T$  is a minimum.
- (iii) Write down the minimum value of  $T$ .
- [6]
- (c) An excursion involves renting the boat and the bus. The cost to rent the boat is \$200 per hour, and the cost to rent the bus is \$150 per hour.
- (i) Find the new value of  $x$  so that the total cost  $C$  to travel from A to B via D is a minimum.
- (ii) Write down the minimum total cost for this journey.
- [4]