Centre of Mass Overview (18/6/23)

Q1 [12 marks]

Find the centre of mass of a semi-circular lamina of radius r.

(a) by integrating wrt x [7 marks]

(b) by integrating wrt y [5 marks]

Q2 [8 marks]

The region between the curve $y = x^3 - x^2$ and the x-axis is rotated by 360° about the x-axis. Find the centre of mass of the solid of revolution obtained.

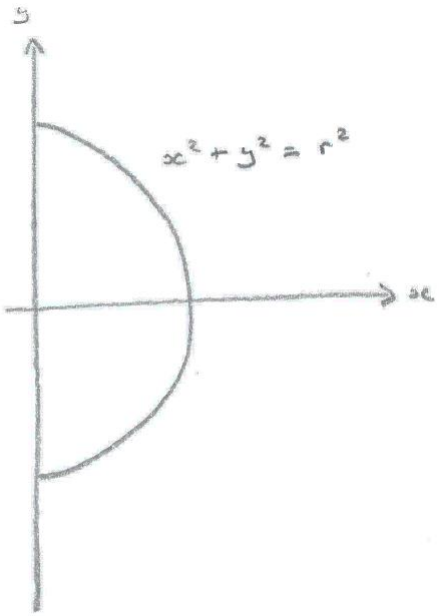
Q3 [9 marks]

Find the centre of mass of the region between the curve

$y = x^3 - x^2$ and the x-axis.

Q4 [4 marks]

Find the centre of mass of the semi-circular lamina shown in the diagram.



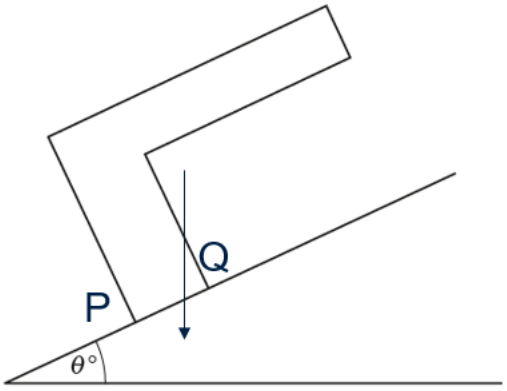
Q5 [Problem/M]

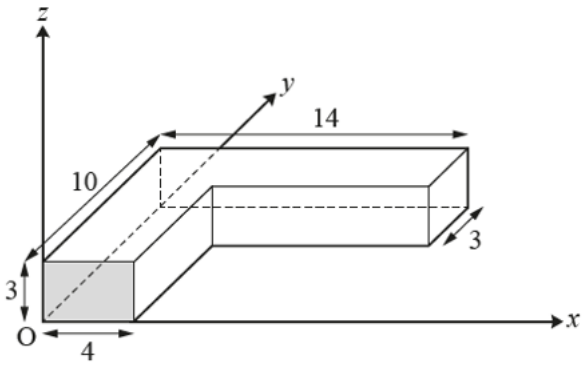
Show that the centre of mass of a parallelogram is at the intersection of the diagonals, by finding the centre of mass of two triangles, given the result that the diagonals bisect each other.

Q6 [Practice/M]

An object lies on a slope as shown in the left-hand diagram below. The dimensions of the object are shown in the right-hand diagram. The shaded end is in contact with the slope and the 4cm edge is along the line of greatest slope.

Given that the surface of the slope is sufficiently rough that the object will not slip, determine the minimum and maximum possible values of θ for which the object does not topple.


P
Q
θ°


z
y
x
O
14
10
3
3
4