

6. (a) A uniform lamina is in the shape of a quadrant of a circle of radius a . Show, by integration, that the centre of mass of the lamina is at a distance of $\frac{4a}{3\pi}$ from each of its straight edges. (7)

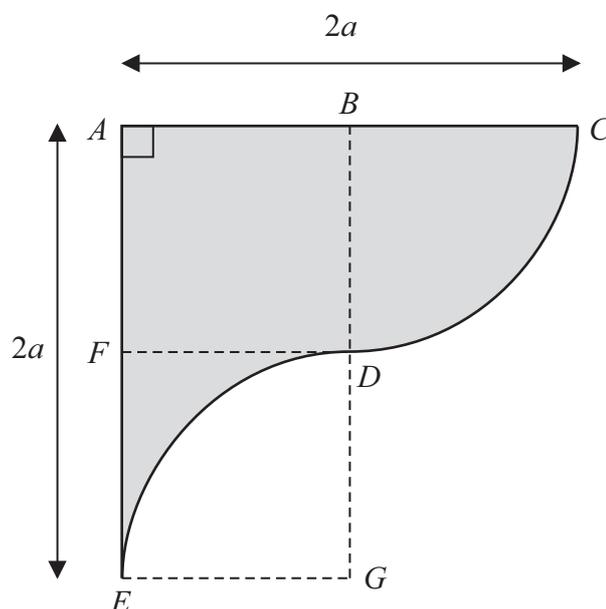


Figure 3

A second uniform lamina $ABCDEFA$ is shown shaded in Figure 3. The straight sides AC and AE are perpendicular and $AC = AE = 2a$. In the figure, the midpoint of AC is B , the midpoint of AE is F , and $ABDF$ and $DGEF$ are squares of side a . BCD is a quadrant of a circle with centre B . DGE is a quadrant of a circle with centre G .

- (b) Find the distance of the centre of mass of the lamina from the side AE . (5)

The lamina is smoothly hinged to a horizontal axis which passes through E and is perpendicular to the plane of the lamina. The lamina has weight W newtons. The lamina is held in equilibrium in a vertical plane, with A vertically above E , by a horizontal force of magnitude X newtons applied at C .

- (c) Find X in terms of W . (3)



