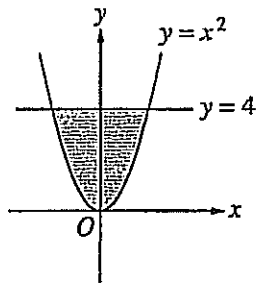


2. The shaded region, R, is bounded by the graph of $y = x^2$ and the line $y = 4$, as shown in the figure above.

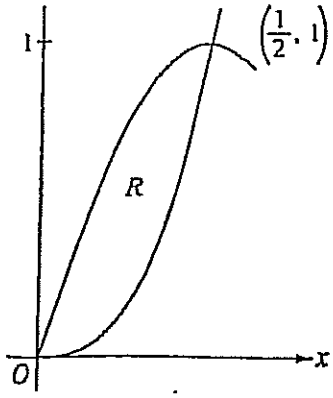
   (a) Find the area of R.

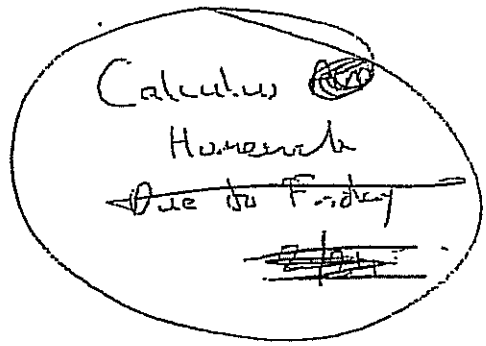
   (b) Find the volume of the solid generated by revolving R about the x-axis.

   (c) There exists a number k, $k > 4$, such that when R is revolved about the line $y = k$, the resulting solid has the same volume as the solid in part (b). Write, but do not solve, an equation involving an integral expression that can be used to find the value of k.

---

1. Find the volume of the solid resulting from rotating the region enclosed by $y = x^2$ and $y = x^3$ about the vertical line $x = 1$.
2. Find the volume of the solid resulting from rotating the region enclosed by $y = \sin x$ and $y = x^2$ about the horizontal line $y = 1$.
3. Find the volume of the solid resulting from rotating the region enclosed by $y = x^2$ and $y = x^3$ about the vertical line $x = -1$.
4. Find the volume of the solid resulting from rotating the region enclosed by $y = \sin x$ and $y = x^2$ about the horizontal line $y = -1$.





3. Let R be the region in the first quadrant enclosed by the graphs of $f(x) = 8x^3$ and $g(x) = \sin(\pi x)$, as shown in the figure above.

(a) Write an equation for the line tangent to the graph of f at $x = \frac{1}{2}$.

(b) Find the area of R.

(c) Write, but do not evaluate, an integral expression for the volume of the solid generated when R is rotated about the horizontal line $y = 1$.

a) y = 2.

WRITE ALL WORK IN THE EXAM BOOKLET.

f) x = 3.

Region R is the base of a solid.

The cross-sections perpendicular to the x-axis are:

a) Squares.

b) Rectangles whose base is in region R and whose height is 3 times its base.

c) Equilateral triangles.

d) Semi-circles.

Write, but do not evaluate, for each, an integral expression for the volume.