9. The length of a curve from $x = 1$ to $x = 5$ is given by $\int_1^5 \sqrt{1 + 36x^4}\,dx$. The curve contains the point $(1, 9)$. Which of the following could be an equation for this curve?

(A) $y = 2x^3 + 7$ (B) $y = 6x^2 + 3$

(C) $y = \frac{36}{5}x^5 + \frac{9}{5}$ (D) $y = x^3 + 8$

Section 1, Part B, Multiple Choice, Technology Permitted

10. The base of a solid is the region in the first quadrant bounded above by the line $y = 2$, below by $y = \sin^{-1} x$, and to the right by the line $x = 1$. For this solid, each cross section perpendicular to the x-axis is a square. What is the volume of the solid?

(A) 1.429 (B) 2 (C) 2.184 (D) 4

Section 2, Part A, Free Response, Technology Permitted

11. Consider the region bounded by the y-axis, $y = 10$, and $y = 1 + 6x^{3/2}$.

(a) Write, but do not evaluate, an integral equation that will find the value of k so that $x = k$ divides the region into two parts of equal area.

(b) Find the length of the curve $y = 1 + 6x^{3/2}$ on the interval $[0, 1]$.

(c) The region is the base of a solid. For this solid, the cross sections perpendicular to the x-axis are rectangles with a height of 3 times that of its width. Find the volume of this solid.

12. Let R be the region bounded by the graphs of

$y = \ln x$ and $y = 2x - 3$.

(a) Find the area of R.

(b) Find the volume of the solid generated when R is revolved about the horizontal line $y = -3$.

(c) Write, but do not evaluate, an expression involving one or more integrals that can be used to find the volume of the solid generated when R is revolved about the y-axis.

13. Let R be the region bounded by the graphs of $y = x^2 - 1$ and $x = y^2$.

(a) Find the area of R.

(b) Find the volume of the solid generated when R is revolved about the vertical line $x = 2$.

(c) Write, but do not evaluate, an expression involving one or more integrals that can be used to find the volume of the solid generated when R is revolved about the horizontal line $y = -1$.

Section 2, Part B, Free Response, No Technology

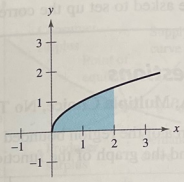
14. A region in the xy-plane is bounded by

$y = 2x + 2$, $x = \frac{y^2}{2} + 2$, $y = -2$, and $y = 2$.

(a) Sketch the bounded region. Label each boundary curve and shade the bounded region.

(b) Find the area of the bounded region. Show the work that leads to your answer.

15. The region shown below is bounded by $y = \sqrt{x}$, $y = 0$, $x = 0$, and $x = 2$.



(a) Find the volume of the solid formed by revolving the region about the x-axis.

(b) Find the volume of the solid formed by revolving the region about the y-axis.

(c) Write, but do not evaluate, an expression involving one or more integrals that gives the volume of the solid formed by revolving the region about the line $y = -2$.

(d) The region shown is the base of a solid. For this solid, each cross section perpendicular to the x-axis is an equilateral triangle. Find the volume of this solid.

16. Consider the region R bounded by the graphs of $y = x^3$, $y = 8$, and the y-axis. The region S is bounded by $y = x^3$, $x = 2$, and the x-axis.

(a) Find the area of R.

(b) Find the volume of the solid formed by revolving R about the y-axis.

(c) The region S is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a semicircle with diameters extending from $y = x^3$ to the x-axis. Find the volume of this solid.

17. Consider the region T bounded by the graphs of $y = x^2$, $y = -2x$, and $x = 2$.

(a) Find the area of T.

(b) Find the volume of the solid formed by revolving T about the horizontal line $y = -4$.

(c) Write, but do not evaluate, an expression involving one or more integrals that gives the perimeter of T.