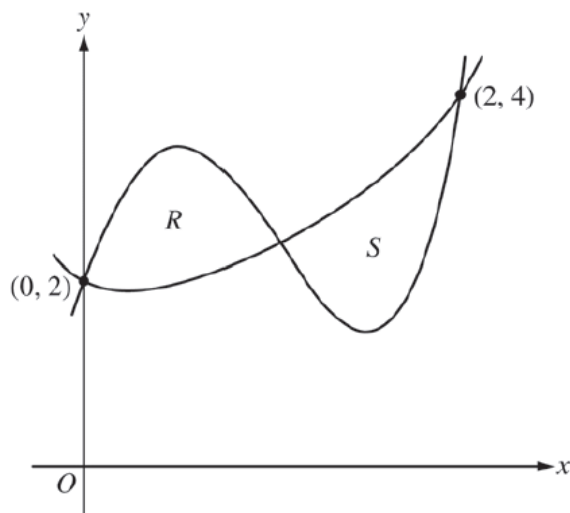


1. **(Calculator Permitted)** Find the average value of  $f(x) = x \sin x$  on the interval  $[1, \pi]$ . Show the set-up to your solution, then use your calculator. Your answer should be correct to three decimal places.

2. 2015 – AB #2 **(Calculator Permitted)**



Let  $f$  and  $g$  be the functions defined by  $f(x) = 1 + x + e^{x^2-2x}$  and  $g(x) = x^4 - 6.5x^2 + 6x + 2$ . Let  $R$  and  $S$  be the two regions enclosed by the graphs of  $f$  and  $g$  shown in the figure above.

- (a) Find the sum of the areas of regions  $R$  and  $S$ .

3. The base of a solid in the  $xy$ -plane is bounded by the  $x$ -axis, the  $y$ -axis and the line  $y = -x + 2$ . Cross sections of the solid perpendicular to the  $x$ -axis are squares. Find the volume.

4. The base of a solid is bounded in the first quadrant by the  $x$ -axis, the  $y$ -axis and the graph of  $y = \sqrt{9-x^2}$ . Cross sections of this solid perpendicular to the  $x$ -axis are semicircles. Find the volume of the solid.

5. **(Calculator Permitted)** The base of a solid is the region in the first quadrant bounded by the graphs of  $y = e^{-x^2}$ ,  $y = 1 - \cos x$  and the  $y$ -axis. For this solid, each cross section perpendicular to the  $x$ -axis is a square. Find the volume of the solid.

6. **(Calculator Permitted)** The base of a solid is the region in the first quadrant bounded by the graphs of  $y = \sqrt{x}$ ,  $y = e^{-3x}$  and the vertical line  $x = 1$ . For this solid each cross section perpendicular to the  $x$ -axis is a rectangle whose height is 5 times the length of its base. Find the volume of the solid.

7.  $\int \frac{x}{\sqrt{9-x^2}} dx =$
- A  $-\frac{1}{2} \ln \sqrt{9-x^2} + C$       B  $\sin^{-1} \frac{x}{3} + C$       C  $-\sqrt{9-x^2} + C$
- D  $-\frac{1}{4} \sqrt{9-x^2} + C$       E  $2\sqrt{9-x^2} + C$

8. **(Calculator Permitted)** Find the instantaneous rate of change of  $f(x) = \frac{x}{\sin x}$  when  $x = \frac{\pi}{3}$ .

9. The curve of  $y = \frac{2x^2}{4-x^2}$  has:

- A two vertical asymptotes  
B two horizontal asymptotes and one vertical asymptote  
C two vertical but not horizontal asymptotes  
D one horizontal and one vertical asymptote  
E one horizontal and two vertical asymptotes

10. 2014 AB #1 (Calculator Permitted)

Grass clippings are placed in a bin, where they decompose. For  $0 \leq t \leq 30$  the amount of grass clippings remaining in the bin is modeled by  $A(t) = 6.687(0.931)^t$ , where  $A(t)$  is measured in pounds and  $t$  is measured in days.

- (a) Find the average rate of change of  $A(t)$  over the interval  $0 \leq t \leq 30$ . Indicate units of measure.  
(b) Find the value of  $A'(15)$ . Using correct units, interpret the meaning of the value in the context of the problem.

Selected Answers:

3. $\frac{8}{3}$	4. $\frac{9\pi}{4}$	5. 0.461	6. 1.554
7. C	8. 0.456 or 0.457	9. E	