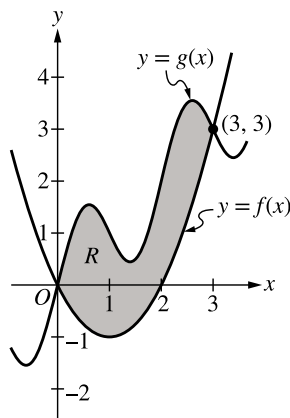


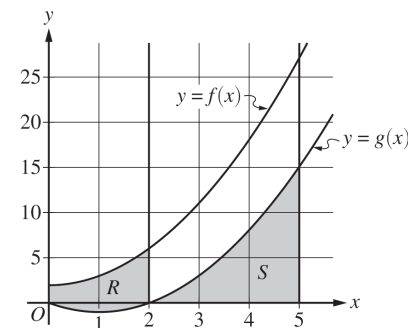
2. The shaded region R is bounded by the graphs of the functions f and g , where $f(x) = x^2 - 2x$ and $g(x) = x + \sin(\pi x)$, as shown in the figure.



(Note: Your calculator should be in radian mode.)

- A. Find the area of R . Show the setup for your calculations.
- B. Region R is the base of a solid. For this solid, at each x the cross section perpendicular to the x -axis is a rectangle with height x and base in region R . Find the volume of the solid. Show the setup for your calculations.
- C. Write, but do not evaluate, an integral expression for the volume of the solid generated when the region R is rotated about the horizontal line $y = -2$.
- D. It can be shown that $g'(x) = 1 + \pi \cos(\pi x)$. Find the value of x , for $0 < x < 1$, at which the line tangent to the graph of f is parallel to the line tangent to the graph of g .

END OF PART A

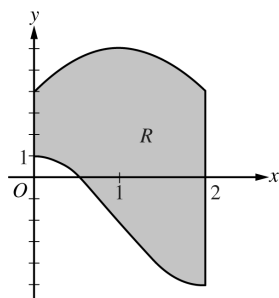


6. The functions f and g are defined by $f(x) = x^2 + 2$ and $g(x) = x^2 - 2x$, as shown in the graph.
- (a) Let R be the region bounded by the graphs of f and g , from $x = 0$ to $x = 2$, as shown in the graph. Write, but do not evaluate, an integral expression that gives the area of region R .
 - (b) Let S be the region bounded by the graph of g and the x -axis, from $x = 2$ to $x = 5$, as shown in the graph. Region S is the base of a solid. For this solid, at each x the cross section perpendicular to the x -axis is a rectangle with height equal to half its base in region S . Find the volume of the solid. Show the work that leads to your answer.
 - (c) Write, but do not evaluate, an integral expression that gives the volume of the solid generated when region S , as described in part (b), is rotated about the horizontal line $y = 20$.

Write your responses to this question only on the designated pages in the separate Free Response booklet. Write your solution to each part in the space provided for that part.

STOP

END OF EXAM



5. Let R be the region enclosed by the graphs of $g(x) = -2 + 3 \cos\left(\frac{\pi}{2}x\right)$ and $h(x) = 6 - 2(x - 1)^2$, the y -axis, and the vertical line $x = 2$, as shown in the figure above.
- (a) Find the area of R .
- (b) Region R is the base of a solid. For the solid, at each x the cross section perpendicular to the x -axis has area $A(x) = \frac{1}{x+3}$. Find the volume of the solid.
- (c) Write, but do not evaluate, an integral expression that gives the volume of the solid generated when R is rotated about the horizontal line $y = 6$.