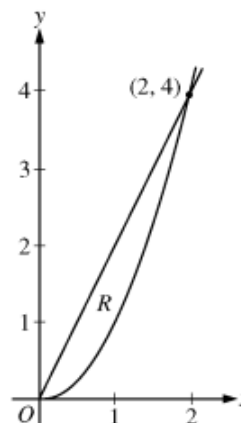


**FRQ Packet #3 - Volumes and Areas****2009 AP Calculus AB FRQ (Form A) Question 4**

No Calculator - In Class

Let  $R$  be the region in the first quadrant enclosed by the graphs of  $y = 2x$  and  $y = x^2$ , as shown in the figure above.

- (a) Find the area of  $R$ .
- (b) The region  $R$  is the base of a solid. For this solid, at each  $x$  the cross section perpendicular to the  $x$ -axis has area  $A(x) = \sin\left(\frac{\pi}{2}x\right)$ . Find the volume of the solid.
- (c) Another solid has the same base  $R$ . For this solid, the cross sections perpendicular to the  $y$ -axis are squares. Write, but do not evaluate, an integral expression for the volume of the solid.

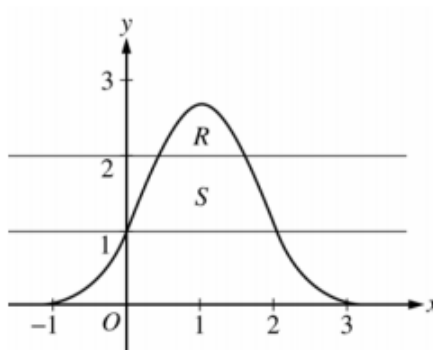


## 2007 AP Calculus AB FRQ (Form B) Question 1

Calculator - In Class

Let  $R$  be the region bounded by the graph of  $y = e^{2x-x^2}$  and the horizontal line  $y = 2$ , and let  $S$  be the region bounded by the graph of  $y = e^{2x-x^2}$  and the horizontal lines  $y = 1$  and  $y = 2$ , as shown above.

- (a) Find the area of  $R$ .
- (b) Find the area of  $S$ .
- (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  $y = 1$ .

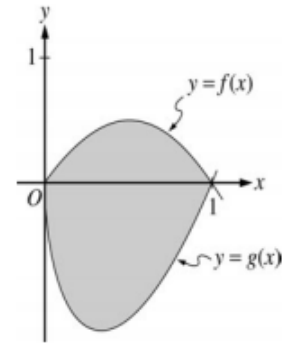


# 2004 AP Calculus AB FRQ (Form A) Question 2

Calculator - HW Not Timed

Let  $f$  and  $g$  be the functions given by  $f(x) = 2x(1 - x)$  and  $g(x) = 3(x - 1)\sqrt{x}$  for  $0 \leq x \leq 1$ . The graphs of  $f$  and  $g$  are shown in the figure above.

- Find the area of the shaded region enclosed by the graphs of  $f$  and  $g$ .
- Find the volume of the solid generated when the shaded region enclosed by the graphs of  $f$  and  $g$  is revolved about the horizontal line  $y = 2$ .
- Let  $h$  be the function given by  $h(x) = kx(1 - x)$  for  $0 \leq x \leq 1$ . For each  $k > 0$ , the region (not shown) enclosed by the graphs of  $h$  and  $g$  is the base of a solid with square cross sections perpendicular to the  $x$ -axis. There is a value of  $k$  for which the volume of this solid is equal to 15. Write, but do not solve, an equation involving an integral expression that could be used to find the value of  $k$ .

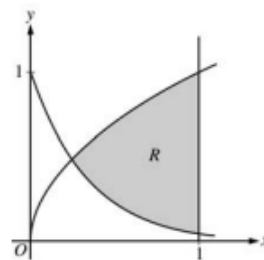


## 2003 AP Calculus AB FRQ (Form A) Question 1

Calculator - HW Timed 15 minutes

Let  $R$  be the shaded region bounded by the graphs of  $y = \sqrt{x}$  and  $y = e^{-3x}$  and the vertical line  $x = 1$ , as shown in the figure above.

- (a) Find the area of  $R$ .
- (b) Find the volume of the solid generated when  $R$  is revolved about the horizontal line  $y = 1$ .
- (c) The region  $R$  is the base of a solid. For this solid, each cross section perpendicular to the  $x$ -axis is a rectangle whose height is 5 times the length of its base in region  $R$ . Find the volume of this solid.



## 2004 AP Calculus AB FRQ (Form B) Question 1

Calculator - HW Timed 15 minutes

Let  $R$  be the region enclosed by the graph of  $y = \sqrt{x-1}$ , the vertical line  $x = 10$ , and the  $x$ -axis.

- (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) Find the volume of the solid generated when  $R$  is revolved about the vertical line  $x = 10$ .