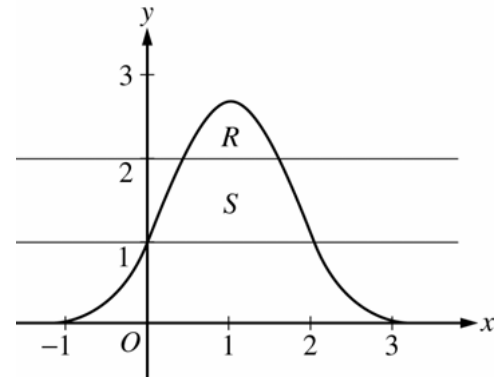


AP[®] CALCULUS AB
2007 SCORING GUIDELINES (Form B)

Question 1

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 $y = 1$.

$e^{2x-x^2} = 2$ when $x = 0.446057, 1.553943$
 Let $P = 0.446057$ and $Q = 1.553943$

(a) Area of $R = \int_P^Q (e^{2x-x^2} - 2) dx = 0.514$

3 : { 1 : integrand
 1 : limits
 1 : answer

(b) $e^{2x-x^2} = 1$ when $x = 0, 2$

Area of $S = \int_0^2 (e^{2x-x^2} - 1) dx - \text{Area of } R$
 $= 2.06016 - \text{Area of } R = 1.546$

3 : { 1 : integrand
 1 : limits
 1 : answer

OR

$\int_0^P (e^{2x-x^2} - 1) dx + (Q - P) \cdot 1 + \int_Q^2 (e^{2x-x^2} - 1) dx$
 $= 0.219064 + 1.107886 + 0.219064 = 1.546$

(c) Volume = $\pi \int_P^Q \left((e^{2x-x^2} - 1)^2 - (2 - 1)^2 \right) dx$

3 : { 2 : integrand
 1 : constant and limits