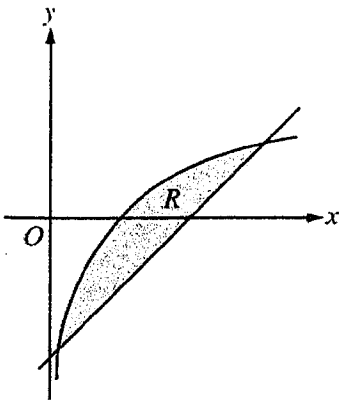
HW

Question 1

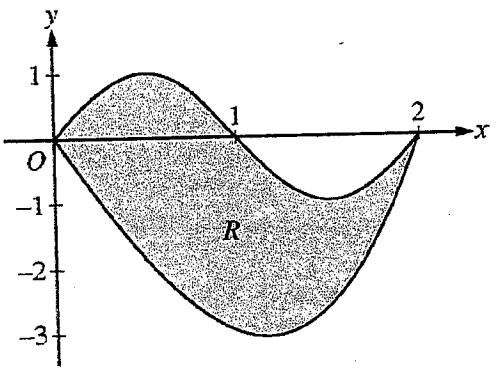
Let R be the shaded region bounded by the graph of $y = \ln x$ and the line $y = x - 2$, as shown above.

(a) Find the area of R.

(b) Find the volume of the solid generated when R is rotated about the horizontal line $y=5$. (calculator)



Question 1



Let R be the region bounded by the graphs of $y = \sin(\pi x)$ and $y = x^3 - 4x$, as shown in the figure above.

(a) Find the area of R.

(b) The horizontal line $y = -2$ splits the region R into two parts. Write, but do not evaluate, an integral expression for the area of the part of R that is below this horizontal line.

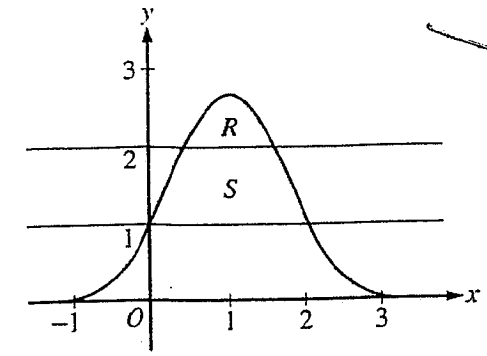
c) Find the volume of the solid generated when R is rotated about the horizontal line $y=-5$. (calculator)

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.

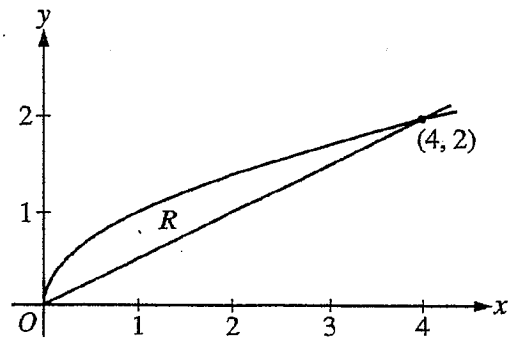


c) Find the volume of the solid generated, when R is rotated about the x-axis.

Question 4

Let R be the region bounded by the graphs of $y = \sqrt{x}$ and $y = \frac{x}{2}$, as shown in the figure above.

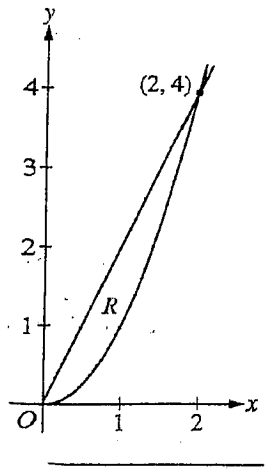
(a) Find the area of R.



b) Write, but do not evaluate, an integral expression for the volume of the solid generated when R is rotated about the x-axis.

Question 4

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.

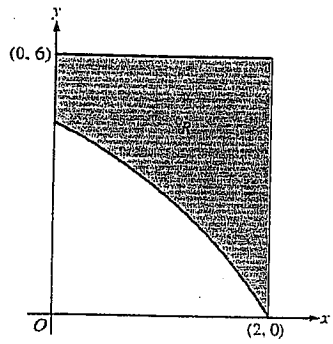


(a) Find the area of R.

b) Write, but do not evaluate, an integral expression for the volume of the solid generated when R is rotated about the horizontal line $y = -1$.

Question 1

In the figure above, R is the shaded region in the first quadrant bounded by the graph of $y = 4\ln(3 - x)$, the horizontal line $y = 6$, and the vertical line $x = 2$.



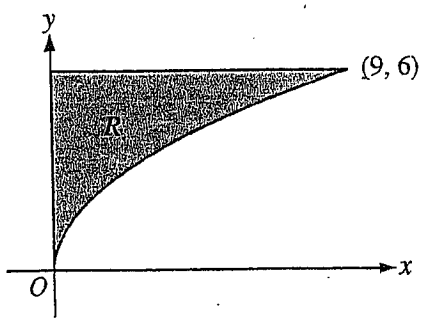
(a) Find the area of R.

b) Find the volume of the solid generated when R is revolved about:

a) $y = 6$

b) $y = 9$.

Question 4



Let R be the region in the first quadrant bounded by the graph of $y = 2\sqrt{x}$, the horizontal line $y = 6$, and the y-axis, as shown in the figure above.

(a) Find the area of R.

b) Write, but do not evaluate, an integral expression that gives the volume of the solid generated when R is rotated about the horizontal line $y = 8$.

Set 5: Multiple-Choice Questions on Integration

1. $\int (3x^2 - 2x + 3)\,dx =$

(A) $x^3 - x^2 + C$ **(B)** $3x^3 - x^2 + 3x + C$ **(C)** $x^3 - x^2 + 3x + C$

(D) $\frac{1}{2}(3x^2 - 2x + 3)^2 + C$ **(E)** none of these

2. $\int \left(x - \frac{1}{2x}\right)^2 dx =$

(A) $\frac{1}{3}\left(x - \frac{1}{2x}\right)^3 + C$ **(B)** $x^2 - 1 + \frac{1}{4x^2} + C$ **(C)** $\frac{x^3}{3} - 2x - \frac{1}{4x} + C$

(D) $\frac{x^3}{3} - x - \frac{4}{x} + C$ **(E)** none of these

3. $\int \sqrt{4 - 2t}\;dt =$

(A) $-\frac{1}{3}(4 - 2t)^{3/2} + C$ **(B)** $\frac{2}{3}(4 - 2t)^{3/2} + C$ **(C)** $-\frac{1}{6}(4 - 2t)^3 + C$

(D) $+\frac{1}{2}(4 - 2t)^2 + C$ **(E)** $\frac{4}{3}(4 - 2t)^{3/2} + C$

4. $\int (2 - 3x)^5\,dx =$

(A) $\frac{1}{6}(2 - 3x)^6 + C$ **(B)** $-\frac{1}{2}(2 - 3x)^6 + C$ **(C)** $\frac{1}{2}(2 - 3x)^6 + C$

(D) $-\frac{1}{18}(2 - 3x)^6 + C$ **(E)** none of these

5. $\int \frac{1 - 3y}{\sqrt{2y - 3y^2}}\,dy =$

(A) $4\sqrt{2y - 3y^2} + C$ **(B)** $\frac{1}{4}(2y - 3y^2)^2 + C$ **(C)** $\frac{1}{2}\ln\sqrt{2y - 3y^2} + C$

(D) $\frac{1}{4}(2y - 3y^2)^{1/2} + C$ **(E)** $\sqrt{2y - 3y^2} + C$

6. $\int \frac{dx}{3(2x-1)^2} =$

(A) $\frac{-3}{2x-1} + C$ **(B)** $\frac{1}{6-12x} + C$ **(C)** $+\frac{6}{2x-1} + C$

(D) $\frac{2}{3\sqrt{2x-1}} + C$ **(E)** $\frac{1}{3}\ln|2x-1| + C$

7. $\int \frac{2\,du}{1+3u} =$

(A) $\frac{2}{3}\ln|1+3u| + C$ **(B)** $-\frac{1}{3(1+3u)^2} + C$ **(C)** $2\ln|1+3u| + C$

(D) $\frac{3}{(1+3u)^2} + C$ **(E)** none of these

8. $\int \frac{t}{\sqrt{2t^2-1}}\,dt =$

(A) $\frac{1}{2}\ln\sqrt{2t^2-1} + C$ **(B)** $4\ln\sqrt{2t^2-1} + C$ **(C)** $8\sqrt{2t^2-1} + C$

(D) $-\frac{1}{4(2t^2-1)} + C$ **(E)** $\frac{1}{2}\sqrt{2t^2-1} + C$

9. $\int \cos 3x\,dx =$

(A) $3\sin 3x + C$ **(B)** $-\sin 3x + C$ **(C)** $-\frac{1}{3}\sin 3x + C$

(D) $\frac{1}{3}\sin 3x + C$ **(E)** $\frac{1}{2}\cos^2 3x + C$

10. $\int \frac{x\,dx}{1+4x^2} =$

(A) $\frac{1}{8}\ln(1+4x^2) + C$ **(B)** $\frac{1}{8(1+4x^2)^2} + C$ **(C)** $\frac{1}{4}\sqrt{1+4x^2} + C$

(D) $\frac{1}{2}\ln|1+4x^2| + C$ **(E)** $\frac{1}{2}\tan^{-1} 2x + C$

11. $\int \frac{dx}{1+4x^2} =$

(A) $\tan^{-1}(2x) + C$ **(B)** $\frac{1}{8}\ln(1+4x^2) + C$ **(C)** $\frac{1}{8(1+4x^2)^2} + C$

(D) $\frac{1}{2}\tan^{-1}(2x) + C$ **(E)** $\frac{1}{8x}\ln|1+4x^2| + C$

30. $\int \frac{\cos x\, dx}{\sqrt{1+\sin x}} =$

(A) $-\frac{1}{2}(1+\sin x)^{1/2}+C$

(B) $\ln\sqrt{1+\sin x}+C$

(C) $2\sqrt{1+\sin x}+C$

(D) $\ln|1+\sin x|+C$

(E) $\frac{2}{3(1+\sin x)^{3/2}}+C$

31. $\int \frac{\cos(\theta-1)\, d\theta}{\sin^2(\theta-1)} =$

(A) $2\ln\sin|\theta-1|+C$ **(B)** $-\csc(\theta-1)+C$ **(C)** $-\frac{1}{3}\sin^{-3}(\theta-1)+C$

(D) $-\cot(\theta-1)+C$ **(E)** $\csc(\theta-1)+C$

32. $\int \sec\frac{t}{2}\, dt =$

(A) $\ln\left|\sec\frac{t}{2}+\tan\frac{t}{2}\right|+C$ **(B)** $2\tan^2\frac{t}{2}+C$ **(C)** $2\ln\cos\frac{t}{2}+C$

(D) $\ln|\sec t+\tan t|+C$ **(E)** $2\ln\left|\sec\frac{t}{2}+\tan\frac{t}{2}\right|+C$

33. $\int \frac{\sin 2x\, dx}{\sqrt{1+\cos^2 x}} =$

(A) $-2\sqrt{1+\cos^2 x}+C$ **(B)** $\frac{1}{2}\ln(1+\cos^2 x)+C$

(C) $\sqrt{1+\cos^2 x}+C$ **(D)** $-\ln\sqrt{1+\cos^2 x}+C$

(E) $2\ln|\sin x|+C$

34. $\int \sec^{3/2} x\tan x\, dx =$

(A) $\frac{2}{5}\sec^{5/2} x+C$ **(B)** $-\frac{2}{3}\cos^{-3/2} x+C$ **(C)** $\sec^{3/2} x+C$

(D) $\frac{2}{3}\sec^{3/2} x+C$ **(E)** none of these

35. $\int \tan\theta\, d\theta =$

(A) $-\ln|\sec\theta|+C$ **(B)** $\sec^2\theta+C$ **(C)** $\ln|\sin\theta|+C$

(D) $\sec\theta+C$ **(E)** $-\ln|\cos\theta|+C$

43. $\int xe^{x^2}\,dx =$

(A) $\frac{1}{2}e^{x^2}+C$ **(B)** $e^{x^2}(2x^2+1)+C$ **(C)** $2e^{x^2}+C$

(D) $e^{x^2}+C$ **(E)** $\frac{1}{2}e^{x^2+1}+C$

44. $\int \cos\theta\, e^{\sin\theta}\,d\theta =$

(A) $e^{\sin\theta+1}+C$ **(B)** $e^{\sin\theta}+C$ **(C)** $-e^{\sin\theta}+C$

(D) $e^{\cos\theta}+C$ **(E)** $e^{\sin\theta}(\cos\theta-\sin\theta)+C$

45. $\int e^{2\theta}\sin e^{2\theta}\,d\theta =$

(A) $\cos e^{2\theta}+C$ **(B)** $2e^{4\theta}(\cos e^{2\theta}+\sin e^{2\theta})+C$ **(C)** $-\frac{1}{2}\cos e^{2\theta}+C$

(D) $-2\cos e^{2\theta}+C$ **(E)** none of these

46. $\int \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx =$

(A) $2\sqrt{x}(e^{\sqrt{x}}-1)+C$ **(B)** $2e^{\sqrt{x}}+C$ **(C)** $\frac{e^{\sqrt{x}}}{2}\left(\frac{1}{x}+\frac{1}{x\sqrt{x}}\right)+C$

(D) $\frac{1}{2}e^{\sqrt{x}}+C$ **(E)** none of these

***47.** $\int xe^{-x}\,dx =$

(A) $e^{-x}(1-x)+C$ **(B)** $\frac{e^{1-x}}{1-x}+C$ **(C)** $-e^{-x}(x+1)+C$

(D) $-\frac{x^2}{2}e^{-x}+C$ **(E)** $e^{-x}(x+1)+C$

***48.** $\int x^2e^x\,dx =$

(A) $e^x(x^2+2x)+C$ **(B)** $e^x(x^2-2x-2)+C$ **(C)** $e^x(x^2-2x+2)+C$

(D) $e^x(x-1)^2+C$ **(E)** $e^x(x+1)^2+C$

49. $\int \frac{e^x+e^{-x}}{e^x-e^{-x}}\,dx =$

(A) $x-\ln\left|e^x-e^{-x}\right|+C$ **(B)** $x+2\ln\left|e^x-e^{-x}\right|+C$

(C) $-\frac{1}{2}(e^x-e^{-x})^{-2}+C$ **(D)** $\ln\left|e^x-e^{-x}\right|+C$

(E) $\ln(e^x+e^{-x})+C$

*An asterisk denotes a topic covered only in Calculus BC.