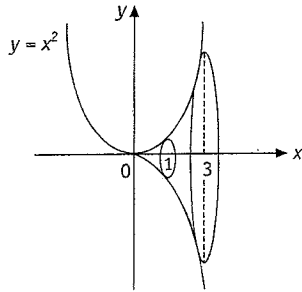


Methods of integration

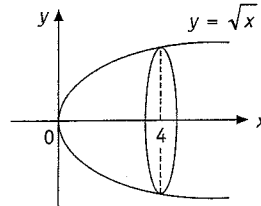
Volume (1)

QUESTION 1 Find the volume of the solid of revolution formed when the given section of the curve is rotated about the x -axis:

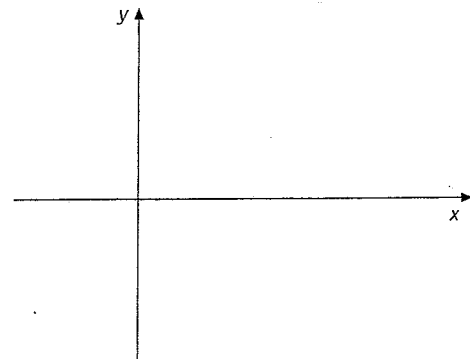
a $y = x^2$ between $x = 1$ and $x = 3$



b $y = \sqrt{x}$ between $x = 0$ and $x = 4$



c $y = \frac{1}{2}x + 1$ between $x = 2$ and $x = 6$

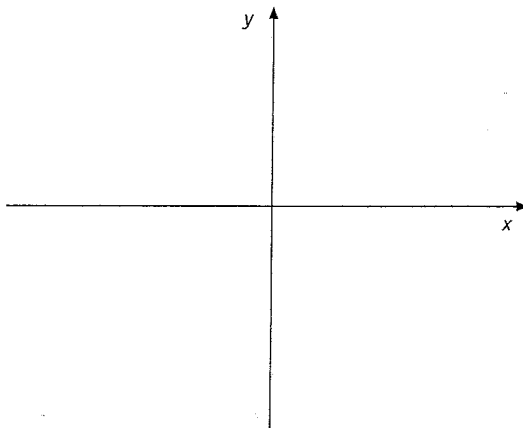


Methods of integration

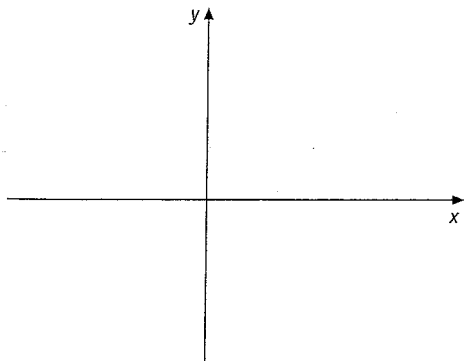
Volume (2)

QUESTION 1 Find the volume of the solid of revolution formed when the given section of the curve is rotated about the x-axis:

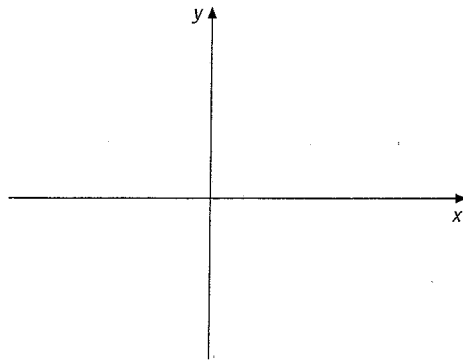
a $y = x^3$ between $x = 0$ and $x = 1$



b $y = x^2 - 4x$ between $x = 0$ and $x = 4$



c $y = \sqrt{9 - x^2}$ between $x = -3$ and $x = 3$

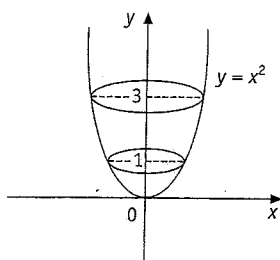


Methods of integration

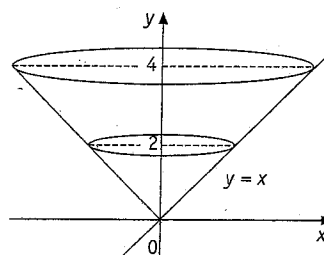
Volume (3)

QUESTION 1 Find the volume when the given section of the curve is rotated about the y -axis:

a $y = x^2$ between $y = 1$ and $y = 3$

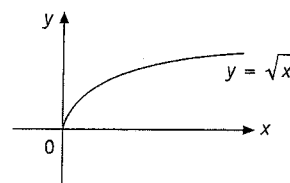


b $y = x$ between $y = 2$ and $y = 4$



QUESTION 2 The diagram shows a sketch of the curve $y = \sqrt{x}$

a Find an expression for x^2 in terms of y



b Find the volume when the section of the curve between $y = 1$ and $y = 4$ is rotated about the y -axis.

Page 46 1 negative, absolute value 2 a $2\frac{1}{3}$ units² b $2\frac{2}{3}$ units² c $1\frac{1}{3}$ units² d $29\frac{1}{3}$ units²

Page 47 1 a 8 units² b 36 units² 2 a $p = 2$ b $12\frac{1}{3}$ units²

Page 48 1 a $x = \pm\sqrt{y-1}$ b $4\frac{2}{3}$ units² 2 a 18 units² b $11\frac{1}{4}$ units²

Page 49 1 a $9\frac{1}{3}$ units² b $2\frac{2}{3}$ units² 2 a 6.4 units² b 25.6 units²

Page 50 1 a $x = 1$ and $x = 12$ b 15.5 units² 2 a i $x = 3$ or $x = 10$ ii $x = -15$ or $x = 2$ b $9\frac{1}{6}$ units²

Page 51 1 a $1\frac{1}{3}$ units² b $21\frac{1}{3}$ units² 2 a $x = -1$ and $x = 3$ b 32 units²

Page 52 1 a $\frac{242\pi}{5}$ units³ b 8π units³ c $\frac{112\pi}{3}$ units³

Page 53 1 a $\frac{\pi}{7}$ units³ b $\frac{512\pi}{15}$ units³ c 36π units³

Page 54 1 a 4π units³ b $\frac{56\pi}{3}$ units³ 2 a $x^2 = y^4$ b $\frac{1023\pi}{5}$ units³

Pages 55-59 1 B 2 A 3 C 4 D 5 B 6 C 7 D 8 A 9 a 54 b -14 c $\frac{7}{8}$ d 910 10 a $4x^3 + C$ b $\frac{x^3}{3} - 4x^2 + 5x + C$

c $\frac{(5x-2)^9}{45} + C$ d $-\frac{1}{x^2} + C$ e $\frac{\sqrt{(6x-1)^3}}{9} + C$ f $8\sqrt{2x+3} + C$ 11 $\frac{2}{3}$ 12 8.7 [1 d.p.] 13 $3\frac{7}{27}$ 14 0.1 [1 d.p.]

15 a $21\frac{1}{3}$ units² b 3.75 units² c $12\frac{2}{3}$ units² d $18\frac{2}{3}$ units² 16 a $\frac{\pi}{5}$ units³ b $\frac{206\pi}{15}$ units³ 17 $\frac{5\pi}{3}$ units³

Page 60 1 a angles b 1 radian c 180 2 a $\frac{\pi}{4}$ b $\frac{\pi}{6}$ c $\frac{\pi}{9}$ d $\frac{\pi}{12}$ e $\frac{2\pi}{5}$ f $\frac{2\pi}{3}$ g $\frac{5\pi}{6}$ h $\frac{11\pi}{6}$ i $\frac{3\pi}{4}$ j $\frac{3\pi}{5}$ k $\frac{7\pi}{4}$

l $\frac{9\pi}{5}$ 3 a 0.977 b 0.611 c 2.007 d 2.793 e 3.491 f 5.376

Page 61 1 a 60° b 36° c 120° d 135° e 270° f 144° g 210° h 75° i 315° j 150° k 240° l 195° 2 a 33° b 79° c 244° 3 a -0.3714 b 0.3874 c -0.3827 d 0.3827 e 0.3090 f 1.7321

Page 62 1 a $\frac{1}{\sqrt{2}}$ b $\frac{\sqrt{3}}{2}$ c $\frac{1}{\sqrt{3}}$ d 1 e $\frac{1}{\sqrt{2}}$ f $\sqrt{3}$ g $\frac{\sqrt{3}}{2}$ h 1 i $\frac{1}{2}$ j 1 k 0 l $\frac{1}{2}$ 2 a $-\frac{1}{\sqrt{3}}$ b -1 c $-\frac{1}{\sqrt{2}}$ d $\frac{\sqrt{3}}{2}$

e $\frac{\sqrt{3}}{2}$ f 1 g $\sqrt{2}$ h $\sqrt{3}$ i -2

Page 63 1 a 1.03 b 1.33 c 0.96 2 a $\frac{\pi}{3}$ or $\frac{2\pi}{3}$ b $\frac{\pi}{4}$ or $\frac{7\pi}{4}$ c $\frac{3\pi}{4}$ or $\frac{7\pi}{4}$ d $\frac{2\pi}{3}$ or $\frac{4\pi}{3}$ e $\frac{\pi}{3}$ or $\frac{4\pi}{3}$ f $\frac{5\pi}{4}$ or $\frac{7\pi}{4}$

Page 64 1 a $\frac{\pi}{4}$ or $\frac{3\pi}{4}$ b $\frac{5\pi}{6}$ or $\frac{11\pi}{6}$ c $\frac{\pi}{6}$ or $\frac{11\pi}{6}$ d $\frac{7\pi}{6}$ or $\frac{11\pi}{6}$ 2 a $x = \frac{5\pi}{6}$ or $x = \frac{7\pi}{6}$ b $x = \frac{\pi}{4}$, $\frac{3\pi}{4}$, $\frac{5\pi}{4}$ or $\frac{7\pi}{4}$

Page 65 1 a $x = \frac{\pi}{4}$ or $\frac{5\pi}{4}$ b $x = \frac{\pi}{6}$, $\frac{5\pi}{6}$ or $\frac{3\pi}{2}$ c $x = \frac{\pi}{6}$, $\frac{5\pi}{6}$, $\frac{7\pi}{6}$ or $\frac{11\pi}{6}$ d $x = \frac{\pi}{12}$, $\frac{7\pi}{12}$, $\frac{13\pi}{12}$ or $\frac{19\pi}{12}$

2 a $x = -\frac{2\pi}{3}$ or $\frac{2\pi}{3}$ b $x = \frac{\pi}{4}$ or $\frac{3\pi}{4}$

Page 66 1 a 2π cm b 4π cm c 120π cm d 4π cm e 15π cm f 10π cm 2 a 16.5 m b 1.6 km c 15.2 m 3 a 21 cm b 35 cm c 15.0 cm [1 d.p.]

Page 67 1 a $\frac{\pi}{2}$ b $\frac{3\pi}{7}$ c $\frac{6\pi}{5}$ 2 a 68° b 33° c 252° 3 131°

Page 68 1 a 80π cm² b 3π cm² c $\frac{5\pi}{4}$ cm² 2 a 33.51 cm² b 54.45 cm² c 992.53 cm² d 15.71 cm² e 62.75 cm² f 3035.78 cm²

Page 69 1 a $(4\pi + 24)$ m b 24π m² 2 b 150°

Page 70 1 29.4 cm² b 39.3 m² 2 a 7.1 cm² b 2.2 cm²