TRIGONOMETRIC FUNCTIONS

1) Change $\frac{\pi}{3}$ into degrees

2) Change $\frac{7\pi}{4}$ into degrees.

3) Convert 210^0 into radians and leave your answer in terms of π.

4) Write 270^0 in radians in terms of π.

5) Change 0.56 radians into degrees and minutes.

6) Change 47^0 13' into radians correct to two decimal places.

7) Find cos 1.04, correct to two decimal places.

8) Find the exact length of the arc cut off when an angle of $\frac{\pi}{3}$ is subtended at the centre of a circle with radius 7 cm.

9) Find the area of the sector formed (to three significant figures) when an angle of $\frac{\pi}{7}$ is subtended at the centre of a circle, radius 5 cm.

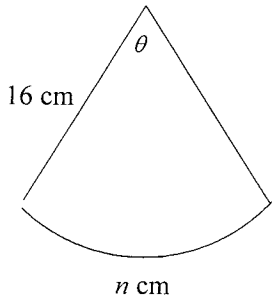
10) An angle of $\frac{\pi}{7}$ is subtended at the centre of a circle with radius 2 m. Find the area of the minor segment formed, correct to three significant figures.

11) An angle of 40^0 is subtended at the centre of a circle of radius 12 mm. Find
(a) the exact length of the arc
(b) the exact area of the sector
(c) the area of the minor segment, correct to two decimal places.

12) A 9 cm arc is cut off by an angle of 0.6 radians at the centre of a circle. What is the radius of the circle?

13) The circumference of a circle is 50 cm and the area of a sector is $\frac{125}{2\pi}$ cm^2. Find
(a) the radius and
(b) the angle that the sector cuts off at the centre of the circle.

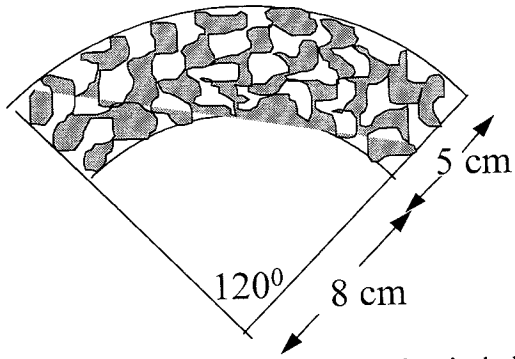
14)



A pendulum swings back and forth in a circular arc at 10 cm per second at the end of a 16 cm long string. It takes 0.7 second to swing from one side to the other.
(a) Find the distance n through which the pendulum swings, to the nearest cm.

(b) Find the size of the angle (to the nearest degree) through which the pendulum swings.

15)



A fan in the shape of a sector of a circle has its frame made of cane and the shaded area is material.

(a) How much cane is used in the frame, to the nearest cm?

(b) What area of material is used in the shaded part of the fan, to the nearest cm^2?

16) Evaluate $\lim_{\theta \to 0} \frac{\sin 2\theta}{\theta}$

17) Find the exact value of $\sin \frac{\pi}{4}$

18) Find the exact value of $\tan \frac{7\pi}{6}$.

19) Simplify $\cos(2\pi - \theta)$

20) Simplify $\tan\left(\frac{\pi}{2} - x\right)$

21) Solve $2 \sin x - 1 = 0$ for $0 \le x \le 2\pi$.

22) Sketch the graph of $y = 2\sin x$ for $0 \le x \le 2\pi$.

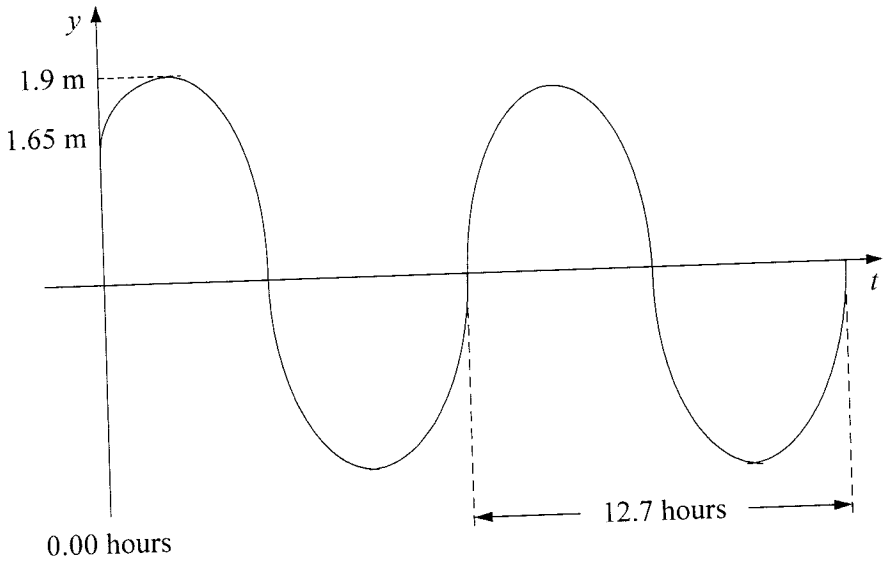
23) Sketch $y = 3\cos\frac{x}{2}$ for $0 \le x \le 4\pi$

24) (a) Sketch $y = \cos x$ and $y = \frac{x}{3}$ on the same set of axes.

(b) Solve $\cos x = \frac{x}{3}$ for $0 \le x \le 2\pi$

25) Show that the equation $\tan x = nx$ has only one solution, $x = 0$, in the domain $-\pi \le x \le \pi$ if n is negative.

26)



The diagram above shows the water level at a tidal beach on a certain day. The water level has an equation approximately of the form $y = a \sin(nt + b)$ where y is the water level in metres and t is the time in hours after 0.00 hours.

(a) Find the amplitude a.

(b) Estimate b by putting $t = 0$. Answer correct to 3 decimal places.

(c) Estimate n to 2 decimal places.

(d) Find the water level after 3 hours, correct to 3 significant figures.

27) Differentiate $\sin 7x$

28) Differentiate $\tan(2x - 1)$

29) Find the derivative of $x \sin x$

30) Differentiate $\cos^4 x$

31) Find the exact gradient of the tangent to the curve $y = \sin x$ at the point where $x = \frac{\pi}{6}$.

32) Find the equation, in exact form, of the normal to the curve $y = 3\cos x$ at the point $\left(\frac{\pi}{3}, 1\frac{1}{2}\right)$.

33) Find the stationary points on the curve $y = \sin 5x$

34) Find the indefinite integral (primitive function) of $\cos 6x$.

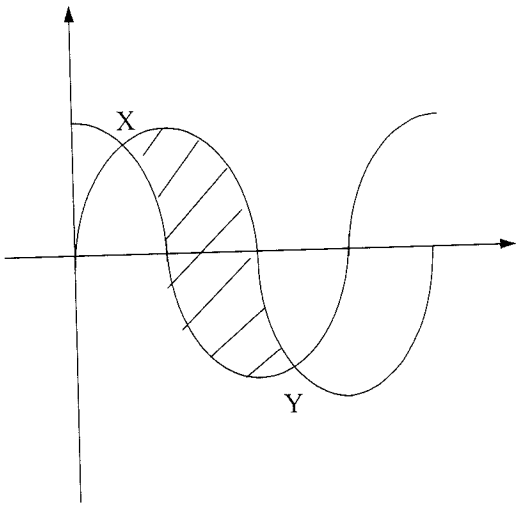
35) Find the indefinite integral of $2\sin(\pi + 3x)$

36) Evaluate $\int_0^{\frac{\pi}{6}} \sec^2 2x \, dx$ in exact form.

37) Find the exact area bounded by the curve $y = \cos 2x$, the x-axis and the lines $x = \frac{\pi}{4}$ and $x = \frac{\pi}{3}$.

38) Find the exact volume of the solid of revolution formed if the curve $y = \sec x$ is rotated about the x-axis from $x = 0$ to $x = \frac{\pi}{6}$.

39)



The diagram above shows the curves $y = \sin x$ and $y = \cos x$.
(a) Find the x-coordinates of points X and Y where the curves intersect.
(b) Find the exact area of the shaded region.

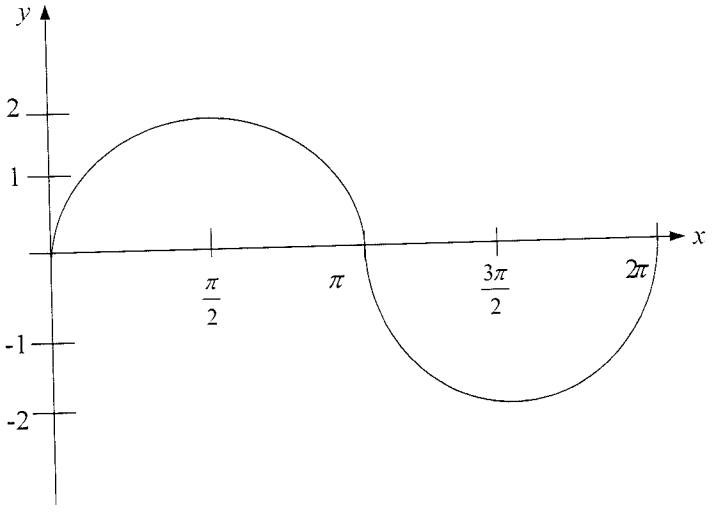
40) (a) Find the exact area enclosed between the curve $y = \sin x$, the x-axis and the lines $x = 0$ and $x = \frac{\pi}{4}$.

(b) This area is rotated about the x-axis. Use Simpson's rule with three function values to find an approximation to the volume of the solid formed, correct to two significant figures.

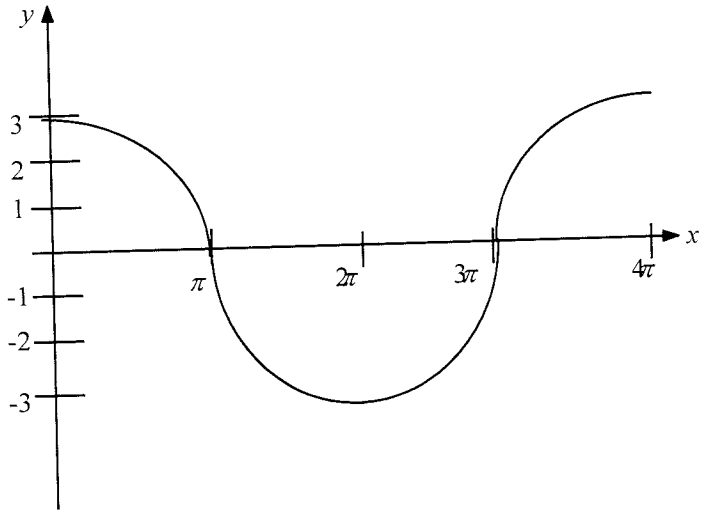
ANSWERS

1) 60^0.
2) 315^0.
3) $\frac{7\pi}{6}$
4) $\frac{3\pi}{2}$
5) $32^05'$
6) 0.82
7) 0.51
8) $\frac{7\pi}{3}$ cm
9) 5.61 cm^2
10) 0.0298 m^2.
11) (a) $\frac{8\pi}{3}$ mm (b) 16π mm^2 (c) 3.98 mm^2
12) 15 cm
13) (a) $\frac{25}{\pi}$ cm (b) $\frac{\pi}{5}$
14) (a) 7 cm (b) 25^0
15) (a) 70 cm (b) 110 cm^2
16) 2
17) $\frac{1}{\sqrt{2}}$
18) $\frac{1}{\sqrt{3}}$
19) $\cos\theta$
20) $\cot x$
21) $x = \frac{\pi}{6}, \frac{5\pi}{6}$

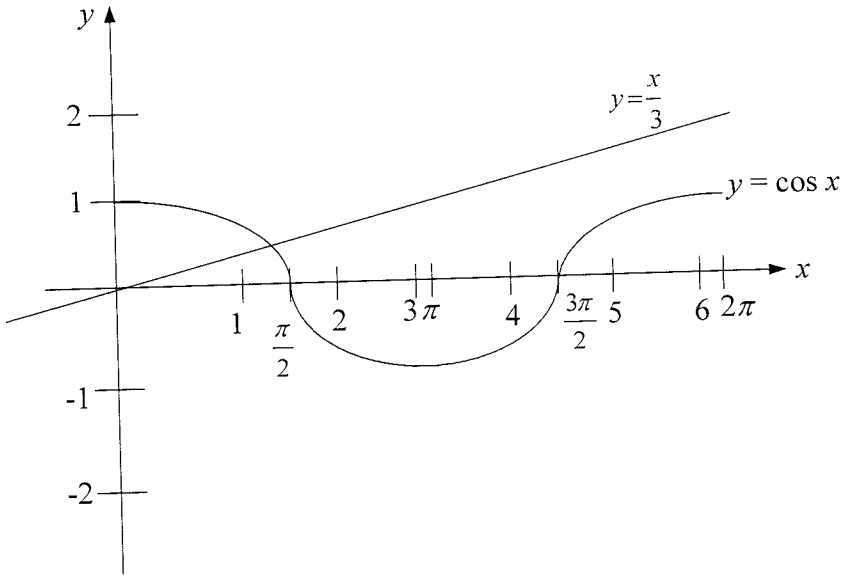
22)



23)

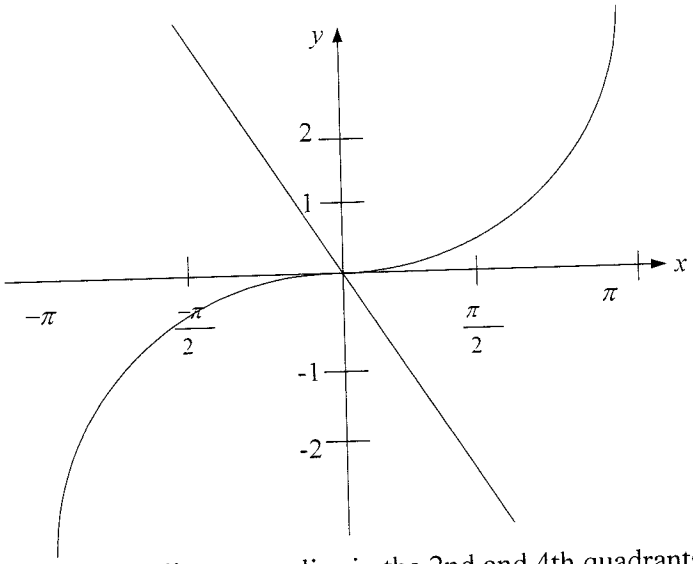


24) (a)



(b) $x = 1.3$

25)



If $n < 0$, the line $y = nx$ lies in the 2nd and 4th quadrants, while the curve $y = \tan x$ is in the 1st and 3rd quadrants. The only point of intersection is $x = 0$.

26) (a) 1.9 (b) 1.052 (c) 0.49 (d) 1.08 m

27) $7 \cos 7x$

28) $2 \sec^2 (2x - 1)$

29) $x \cos x + \sin x$

30) $-4 \sin x \cos^3 x$

31) $\dfrac{\sqrt{3}}{2}$

32) $12x - 18\sqrt{3}y - 4\pi + 27\sqrt{3} = 0$

33) $\left(\frac{\pi}{10},1\right),\left(\frac{3\pi}{10},-1\right),\left(\frac{\pi}{2},1\right),\left(\frac{7\pi}{10},-1\right),\ldots$

34) $\frac{1}{6}\sin 6x + C$

35) $-\frac{2}{3}\cos(\pi + 3x) + C$

36) $\frac{\sqrt{3}}{2}$

37) $\frac{1}{2}\left(\frac{\sqrt{3}-2}{2}\right)$ units^2

38) $\frac{\pi}{\sqrt{3}}$ units^3

39) (a) X: $\frac{\pi}{4}$, Y: $\frac{5\pi}{4}$ (b) $2\sqrt{2}$ units^2

40) (a) $1-\frac{1}{\sqrt{2}} = \frac{2-\sqrt{2}}{2}$ units^2 (b) 0.45 units^3