

Trigonometry, radians, trig functions and trig equations

1. Without using a calculator, give the exact values of the following. Draw a circle diagram for each angle not in the first quadrant.

- (a) $\sin \frac{\pi}{6}$ (b) $\cos \frac{\pi}{4}$ (c) $\tan \frac{\pi}{3}$ (d) $\cos \frac{\pi}{2}$ (e) $\tan 0$ (f) $\sin \frac{\pi}{3}$
 (g) $\cos \pi$ (h) $\tan \frac{5\pi}{4}$ (i) $\sin(-\frac{\pi}{6})$ (j) $\cos \frac{11\pi}{6}$ (k) $\tan \frac{5\pi}{6}$ (l) $\sin \frac{21\pi}{4}$

2. Simplify the following as much as possible.

- (a) $\sin(\pi - \theta) + \sin(\pi + \theta)$ (b) $\cos(2\pi + \theta) - \cos(\pi + \theta)$
 (c) $\tan(-\theta) + 2 \tan(\pi + \theta)$ (d) $\cos(\frac{\pi}{2} - \theta) + \sin(\pi + \theta)$

3. Without a calculator, solve the following for $-2\pi < x < 2\pi$. Draw a circle diagram for each.

- (a) $\sin x = 0.5$ (b) $\cos x = -\frac{\sqrt{3}}{2}$ (c) $\tan x = -1$ (d) $\sin x = \frac{1}{\sqrt{2}}$

4. With a calculator, solve the following for $0 < x < 2\pi$.

- (a) $\tan x = 0.4$ (b) $\sin x = -0.83$ (c) $\cos x = 0.11$ (d) $\tan x = -2.5$

5. With a calculator, solve the following for $0 < x < 2\pi$.

- (a) $\sin x + 2 = 1.7$ (b) $3 \sin x = 0.9$ (c) $\tan 2(x - 0.1) = -2$
 (d) $4 \cos(x + 0.2) - 3 = -2$ (e) $5 \sin 2(x - \frac{\pi}{4}) + 3 = 1$

6. Draw the graphs of these functions showing about 2 periods. Show the parameters and characteristics as working.

- (a) $y = 3 \sin 4x + 2$ (b) $y = -0.5 \cos 2(x - \frac{\pi}{6}) - 2$

7. The height of the tide on Tuesday is given by the function $h = 1.5 \sin 0.5(t + 2) + 1.8$ where h is the height in metres and t is the time in hours since midnight.

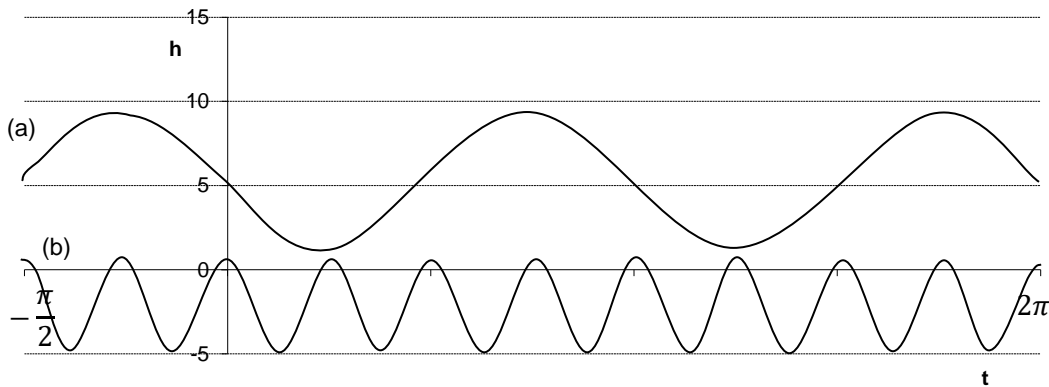
- (a) Find the tide height at 5 a.m.
 (b) Find the times of the high and low tides on Tuesday.
 (c) Find the times during Tuesday when the tide height is 0.7 m.
 (d) A causeway is traversable only when the tide height is below 1 m. For how long on Tuesday will the causeway be traversable?
 (e) For what fraction of the time on Tuesday will the tide be within 0.2 m of the high tide level?

8. The temperature follows a sinusoidal pattern over time ranging from 10° to 24° each day with the highest temperature occurring at 3 pm.

- (a) Write a formula for the temperature, T at any number of hours, t , since midnight.
 (b) What is the temperature at 11 a.m.?
 (c) For how long each night is the temperature below 12° ?

Trig Revision 2

- Find the equations for these two sinusoidal functions. Show the characteristics and parameters as working



- The water depth at a dock varies according to the formula

$$w = 1.1 \cos \frac{\pi}{6} t + 2.4$$

where t is the number of hours midnight. A fishing boat needs to dock and unload, but can only be in the dock when the water depth is more than 3 m. If it arrives at 6 a.m., when will it first be able to dock and how long can it stay?

- Henry's body temperature varies each day from a minimum of 36.7° at 5 a.m. to a maximum of 37.2° at 5 p.m. What percentage of each day is it above 37° ?

What assumptions do you need to make and what are their effects?

Answers

- (a) $h = -4 \sin 2t + 5$ (b) $h = 3 \cos 8t - 2$
- 10:06 a.m., 3 h 53 min
- 36.9% You have to assume the variation is sinusoidal.