Trig Revision 1

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) $\sin \pi/6$ (b) $\cos \pi/4$ (c) $\tan \pi/3$ (d) $\cos \pi/2$ (e) $\tan 0$ (f) $\sin \pi/3$

   (g) $\cos \pi$ (h) $\tan 5\pi/4$ (i) $\sin(-\pi/6)$ (j) $\cos 11\pi/6$ (k) $\tan 5\pi/6$ (l) $\sin 21\pi/4$

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) $\cos(\pi/2 - \theta) + \sin(\pi + \theta)$

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°?

9. Solve for $0 < x < 2\pi$:

   (a) $\sin 5x = 2\cos 5x$ (b) $\sin^2 x + 6 = 5\sin x$

   (c) $2\cos^2 x + 5\sin x + 1 = 0$ (d) $\sin 3x + 2\cos(3\pi/2 - 3x) = 0.7$

Answers

1. (a) ½ (b) $^1/_{\sqrt{2}}$ (c) $\sqrt{3}$ (d) 0 (e) 0 (f) $^{\sqrt{3}}/_2$

   (g) –1 (h) 1 (i) –½ (j) $^{\sqrt{3}}/_2$ (k) $^1/_{\sqrt{3}}$ (l) $-^1/_{\sqrt{2}}$

2. (a) 0 (b) $2\cos\theta$ (c) $\tan\theta$ (d) 0

3. (a) $\frac{\pi}{6}, \frac{5\pi}{6}, -\frac{7\pi}{6}, -\frac{11\pi}{6}$ (b) $\frac{5\pi}{6}, \frac{7\pi}{6}, -\frac{5\pi}{6}, -\frac{7\pi}{6}$

   (c) $\frac{3\pi}{4}, \frac{7\pi}{4}, -\frac{\pi}{4}, -\frac{5\pi}{4}$ (d) $\frac{\pi}{4}, \frac{3\pi}{4}, -\frac{5\pi}{4}, -\frac{7\pi}{4}$

4. (a) 0.38, 1.95 (b) 4.12, 5.30 (c) 1.46, 4.82 (d) 1.95, 5.09

5. (a) 3.45, 5.98 (b) 0.30, 2.84 (c) 1.12, 2.69, 4.26, 5.83

   (d) 1.12, 4.77 (e) 0.58, 2.56, 3.72, 5.70

6. (a) $a = 3$, $b = 4$, $c = 0$, $d = 2$; amp = 3, per = $\frac{\pi}{2}$, phase shift = 0, mp = 2.

   (b) $a = 0.5$, $b = 2$, $c = -\frac{\pi}{6}$, $d = -2$; amp = 0.5, per = π, phase shift = $\frac{\pi}{6}$, mp = –2

   Check graphs with calculator.

7. (a) 1.27 m (b) High tides 1:08 am, 1:42 pm; low tides 7:25 am, 7:59 pm

   (c) 5:56 am, 8:52 am, 6:30 pm, 9:29 pm (d) 8 h 6 min (e) 0.235

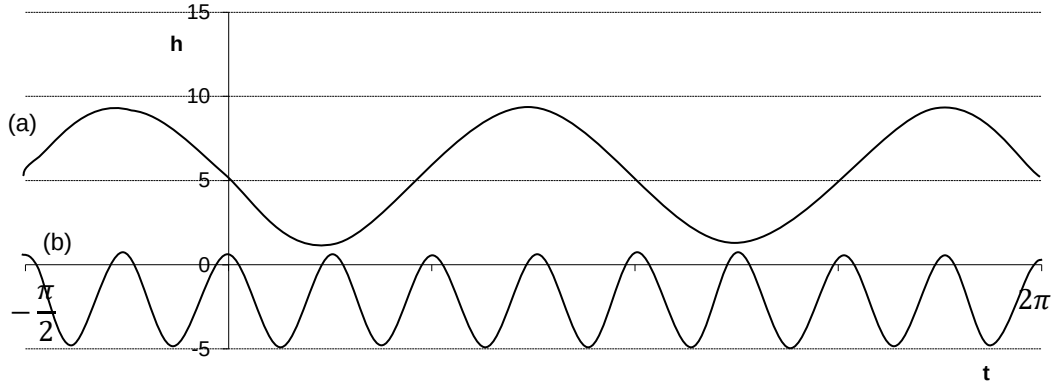
8. (a) $T = -7\cos\frac{\pi}{12}(t-3) + 17$ (b) 13.5° (c) 5 h 55 min

9. (a) 0.22, 0.85, 1.48, 2.11, 2.73, 3.36, 3.99, 4.62, 5.25, 5.88 (b) No solutions

   (c) $\frac{5\pi}{6}, \frac{11\pi}{6}$ (d) 1.31, 1.84, 3.40, 3.93, 5.49, 6.03

Trig Revision 2

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



2. 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?

3. 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

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