Pre-Calculus 12 Trigonometric Applications…again

1. Due to the tidal variations, the depth of water in a harbor is given by the formula

$$D = 6 + 4\cos\left(32t + \frac{3\pi}{5}\right)$$

$D = 4\cos\left(32t + \frac{3\pi}{5}\right) + 6$

where D is the depth of water in metres and t is the time in hours after midnight on Monday night.

a) What were the greatest and least depths of water in the harbor?

max = D + A
= 6 + 4
= 10 m
↑ greatest

min = D − A
= 6 − 4
= 2 m
↑ least

b) A boat needs at least 4 metres of water to leave the harbor. Can the boat leave the harbor at 3:00 p.m. Tuesday? Justify your answer.

3:00 p.m
15 hrs after midnight Mon

$D = 4\cos\left(32(15) + \frac{3\pi}{5}\right) + 6$

$= 4.630$ m

∴ Yes, the boat can leave the harbour.

2. On a typical day at an ocean port the water has a maximum depth of 20 metres at 8:00 am. The minimum depth of 8 metres occurs 6.2 hours later. Assume the relationship between the depth of the water and the time is a sinusoidal function.

a) What is the period?

max → min → max
6.2 hrs 6.2 h

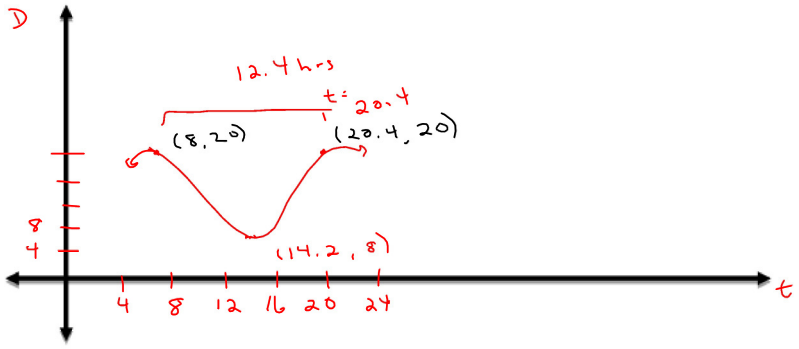
12.4 hrs

b) Write the cosine equation for the depth of the water at any time t hours.

$A = \frac{20-8}{2} = 6$ $D = \frac{20+8}{2} = 14$ $B = \frac{2\pi}{12.4} = \frac{\pi}{6.2}$ $C = 8$

$$D = 6\cos\left(\frac{\pi}{6.2}(t-8)\right) + 14$$

c) Sketch a graph



d) Calculate the depth of the water at 10:00 am.

$D = 6\cos\left(\frac{\pi}{6.2}(10-8)\right) + 14$
$= 17.174$ m

Assignment: Pg ~~544; CYU #1; Pg 548; #4a, 5a, 7~~ pg. 276 # 7, 8, 10, 17, 19, 21