Given y=Acos(Bx+C) + D. Throughout the day the depth of water at the end of a pier varies with the tides. High tide occurs at 4 am with a depth of 6 meters. Low tide occurs at 10 am with a depth of 2 meters. Model the problem by using the given trigonometric equation to show the depth of the water t hours after midnight showing all your work.
Solve the problem by finding the depth of the water at noon, explaining the reasoning.

Solution

y varies from 2 to 6, which is 4 ± 2, so A = 2, D=4

period is 12 hours, so $B = \frac{2\pi}{12} = \frac{\pi}{6}$

high tide is at x=4, not x=0

$$C = -\frac{2\pi}{3}$$

$$y = 2cos(\frac{\pi}{6}(x-4)) + 4$$

$$= 2cos(\frac{\pi}{6}x - \frac{2\pi}{3}) + 4$$

Equation should be

$$h = 2cos(\frac{\pi}{6}x - \frac{2\pi}{3}) + 4$$

where h is the height of the water and t is the time (number of hours after midnight)