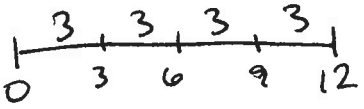
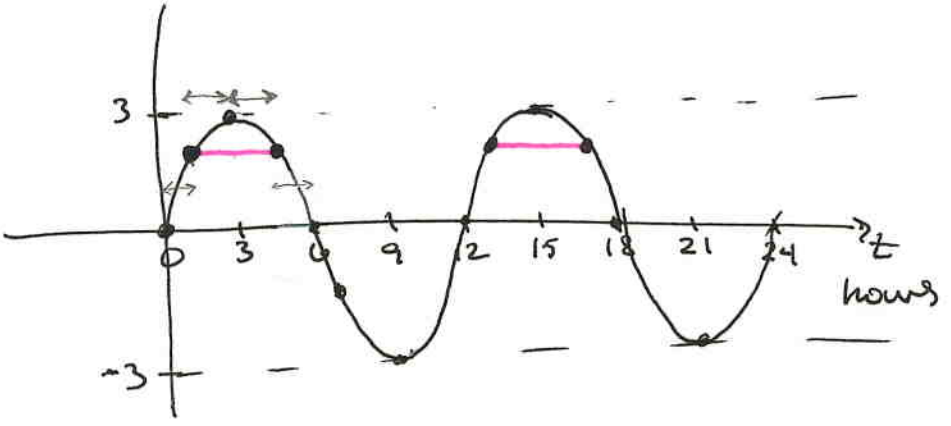
IB Math 1 Sinusoidal Modeling

The height of the tide above mean sea level on January 24th at Cape Town is modelled approximately by $h(t) = 3\sin\left(\frac{\pi t}{6}\right)$ meters where t is the number of hours after midnight.

a. Graph $y = h(t)$ for $0 \le t \le 24$.

Period: 12 hours
axis: $y=0$
P.S. none
Amp: 3 meters





b. When is high tide and what is the maximum height?

$t = 3, 15$ hours after midnight

max height: 3 meters above the mean

c. What is the height of the tide at 7 am?

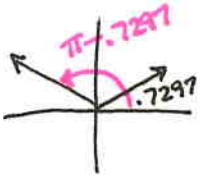
$t = 7 \quad h(7) = 3\sin\left(\frac{\pi \cdot 7}{6}\right)$

$= -\frac{3}{2}$ meters

d. A ship can cross the harbor provided the tide is at least 2 meters above mean sea level. For what values of t is crossing possible on January 24th?

$2 = 3\sin\left(\frac{\pi t}{6}\right)$

$\frac{2}{3} = \sin\left(\frac{\pi t}{6}\right)$



$\frac{\pi t}{6} = \sin^{-1}\left(\frac{2}{3}\right) = .7297, 2.4119$

$t = (.7297)\frac{6}{\pi}, (.7297)\cdot\frac{6}{\pi}$

$t = 1.3937, 4.6063$

$t = 1.3937, 4.6063$, $+12$

$13.3937, 16.6063$

$t \in [1.3937, 4.6063] \cup [13.3937, 16.6063]$