TRIGONOMETRY–REAL NUMBERS

A

$B=3$, $VD=5$, $A=-2$

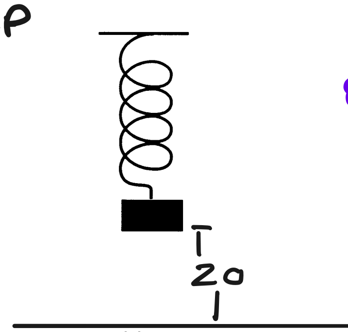
1. A minimum value of a sinusoidal function is at $\left(\frac{\pi}{4}, 3\right)$. The nearest maximum value to the right of this point is at $\left(\frac{7\pi}{12}, 7\right)$. Determine an equation of this function.

$y=-2\cos 3\left(x-\frac{\pi}{4}\right)+5$

2. A sinusoidal curve has a minimum point at $\left(-\frac{\pi}{3},-5\right)$ and the closest maximum point to the right is $\left(\frac{\pi}{6},3\right)$. Determine an equation of this curve.

$y=2\sin 3\left(x-\frac{5\pi}{12}\right)+5$

3. A mass is supported by a spring so that it rests 50 cm above a table top, as shown in the diagram below. The mass is pulled down to a height of 20 cm above the table top and released at time $t=0$. It takes 0.8 seconds for the mass to reach a maximum height of 80 cm above the table top. As the mass moves up and down, its height h, in cm, above the table top, is approximated by a sinusoidal function of the elapsed time t, in seconds, for a short period of time.



$\frac{80+20}{2}=VD$, $\frac{100}{2}=50 \Rightarrow VD$

$\frac{80-20}{2}=Amp$, $\frac{60}{2}=30 \Rightarrow Amp$

$(0.8-0)2=P$, $(0.8)2=P$, $1.6=P$

$B=\frac{2\pi}{1.6}$

Determine an equation for a sinusoidal function that gives h as a function of t.

$y=-30\cos\frac{2\pi}{1.6}(x)+50$

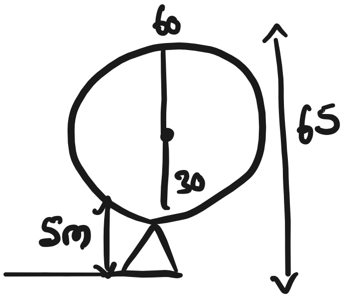
Sin = average between min and max / 2

$y=30\sin\frac{2\pi}{1.6}(x-0.4)+50$

$y = -30 + 50 = 20$

4. A Ferris wheel with a radius of 30 m rotates once every 100 s. At time $t = 0$ s, passengers get on at the lowest point of its rotation which is 5 m above the ground.

min = 5
max = 65

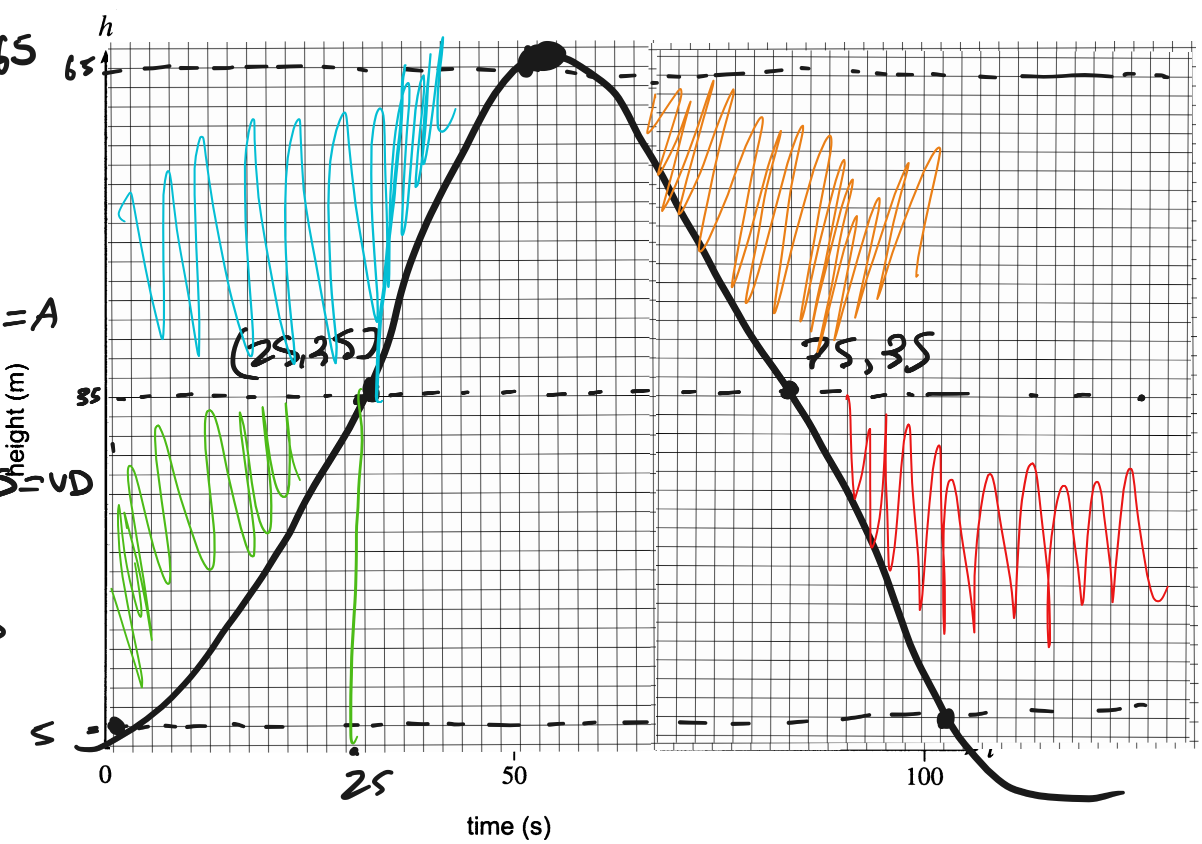


a) Using the grid below, graph how the height h of a passenger varies with respect to the elapsed time t during at least one rotation of the Ferris wheel. Clearly show at least 5 points on your graph and indicate the scale on the vertical axis.

$\frac{65-5}{2} = \frac{60}{2} = 30 = A$

$\frac{65+5}{2} = \frac{70}{2} = 35 = VD$

$\frac{2\pi}{100} = \frac{\pi}{50} = B$



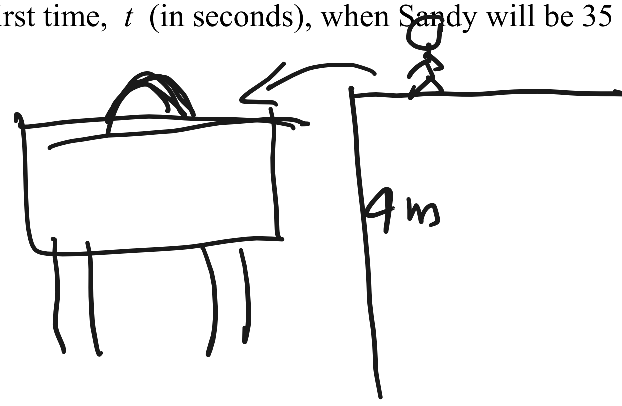
b) Determine a sine function that gives the passenger's height h metres above the ground as a function of time t seconds.

$y = 30\sin\frac{\pi}{50}(x-25) + 35$

5. A Ferris wheel has a radius of 25 m and its centre is 27 m above the ground. It rotates once every 40 seconds. Sandy gets on the Ferris wheel at its lowest point and the wheel starts to rotate.

a) Determine a sinusoidal function that gives Sandy's height, h, above the ground as a function of the elapsed time, t, where h is in metres and t is in seconds.

b) Determine the first time, t (in seconds), when Sandy will be 35 m above the ground.



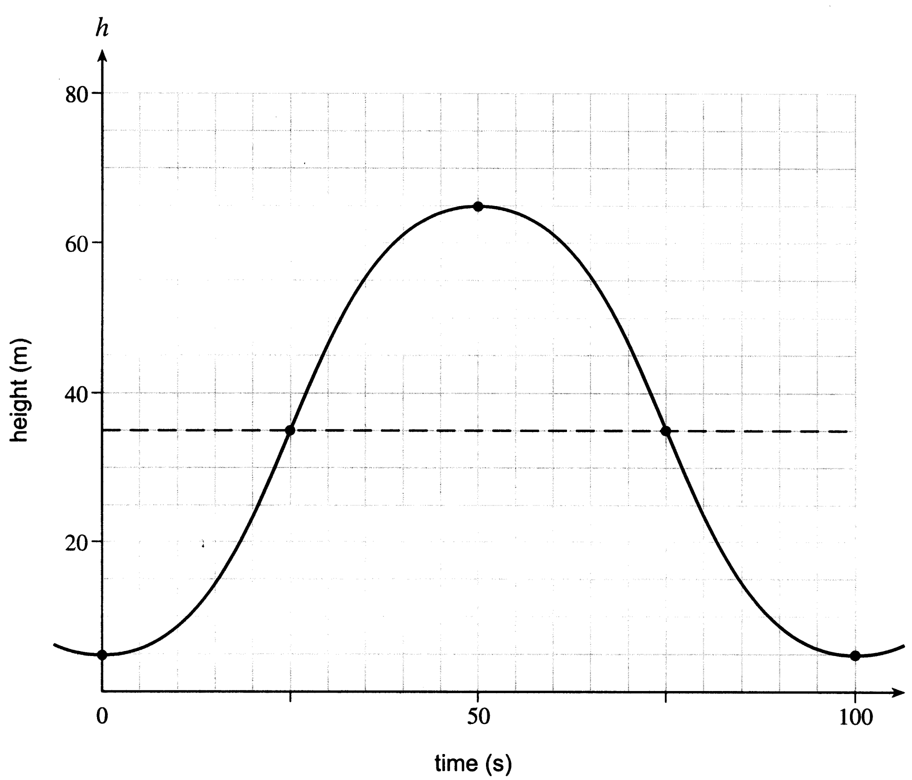
TRIGONOMETRY–REAL NUMBERS **A**

1. $y = 2\sin 3\left(x - \frac{5\pi}{12}\right) + 5$ **or** $y = -2\cos 3\left(x - \frac{\pi}{4}\right) + 5$

2. $y = 4\cos 2\left(x - \frac{\pi}{6}\right) - 1$ **OR** $y = -4\cos 2\left(x + \frac{\pi}{3}\right) - 1$ **OR** $y = 4\sin 2\left(x + \frac{\pi}{12}\right) - 1$ **OR** $y = -4\sin 2\left(x - \frac{5\pi}{12}\right) - 1$

3. $h = -30\cos\frac{2\pi}{1.6}t + 50$ **OR** $h = 30\sin\frac{2\pi}{1.6}(t - 0.4) + 50$ **OR** $h = 30\cos\frac{2\pi}{1.6}(t - 0.8) + 50$ **OR** $h = -30\sin\frac{2\pi}{1.6}(t - 1.2) + 50$ **OR** $h = -30\sin\frac{2\pi}{1.6}(t + 0.4) + 50$

4. a)



b) $h = 30\sin\frac{2\pi}{100}(t - 25) + 35$ **OR** $h = -30\sin\frac{2\pi}{100}(t - 75) + 35$ **OR** $h = -30\sin\frac{2\pi}{100}(t + 25) + 35$

5. a) $h = -25\cos\frac{2\pi}{40}t + 27$

b) $t = 12.07$ s