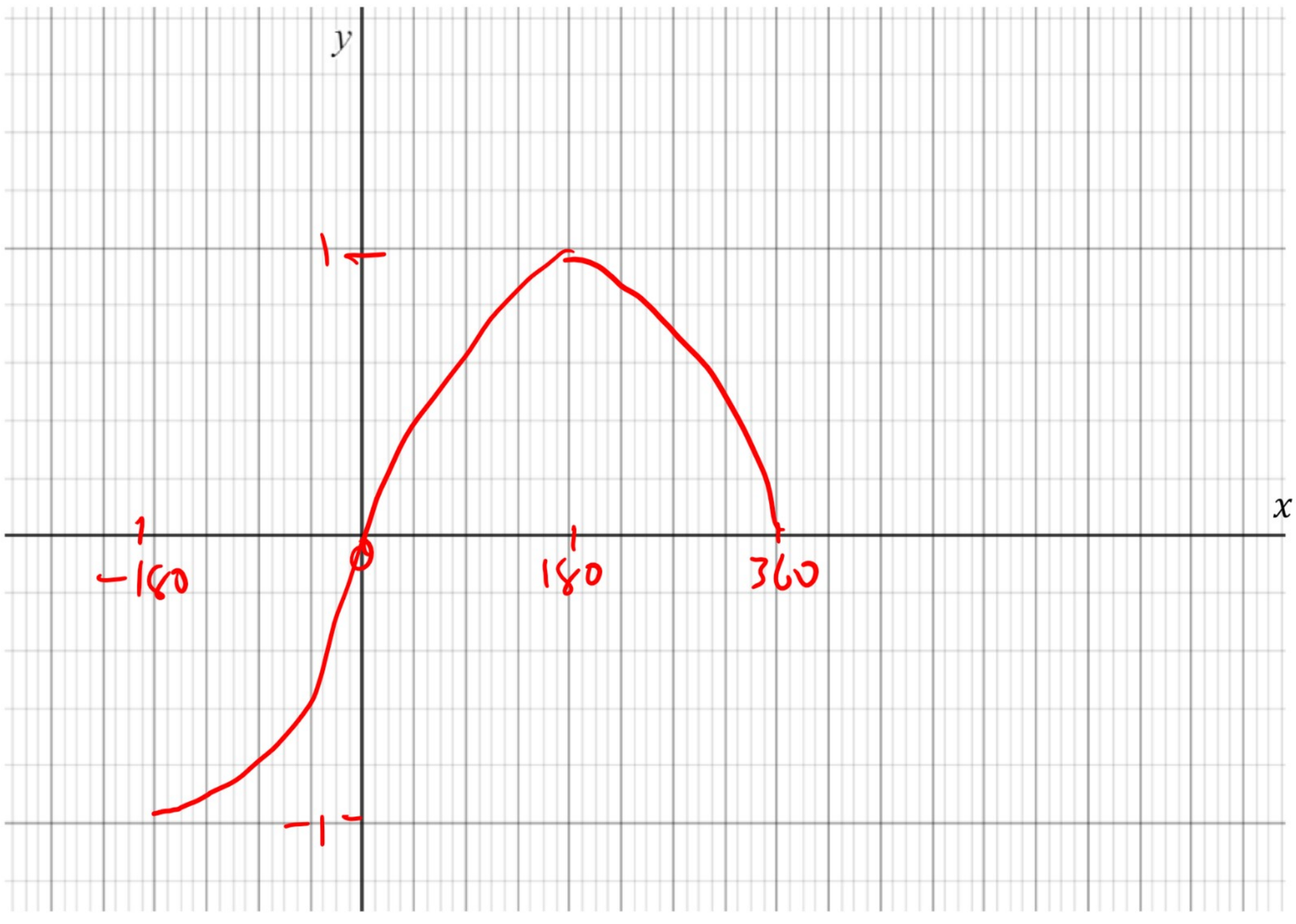
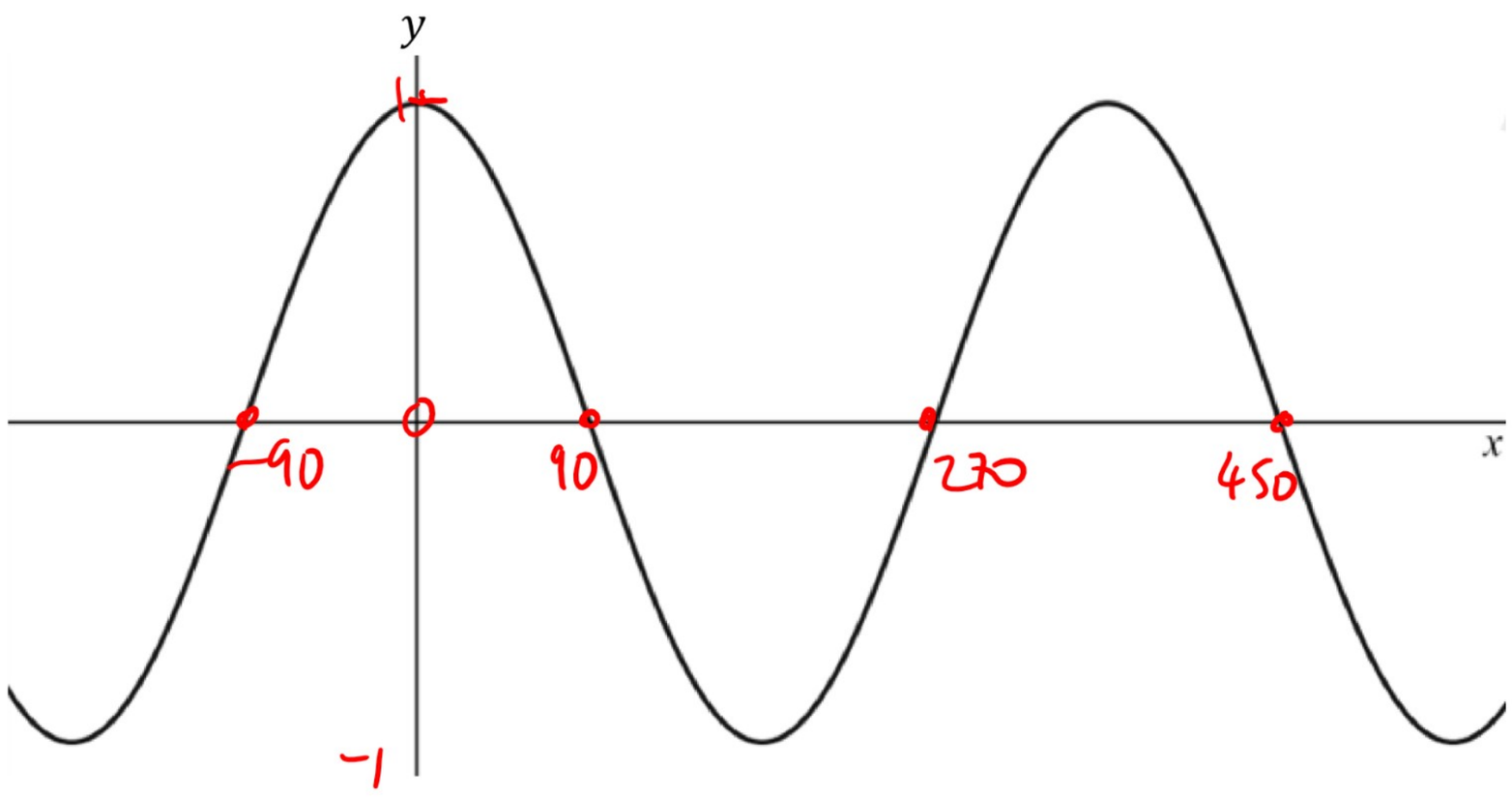
Trigonometric & Exponential Graphs Exam Practice

Q1. On the grid, draw a sketch of y = sin(x), for $-180° \leq x \leq 360°$.



(2 marks)

Q2. Below is a sketch of y = cos(x).



a) Label all the points where the curve crosses the x-axis and where it crosses the y-axis.

(2 marks)

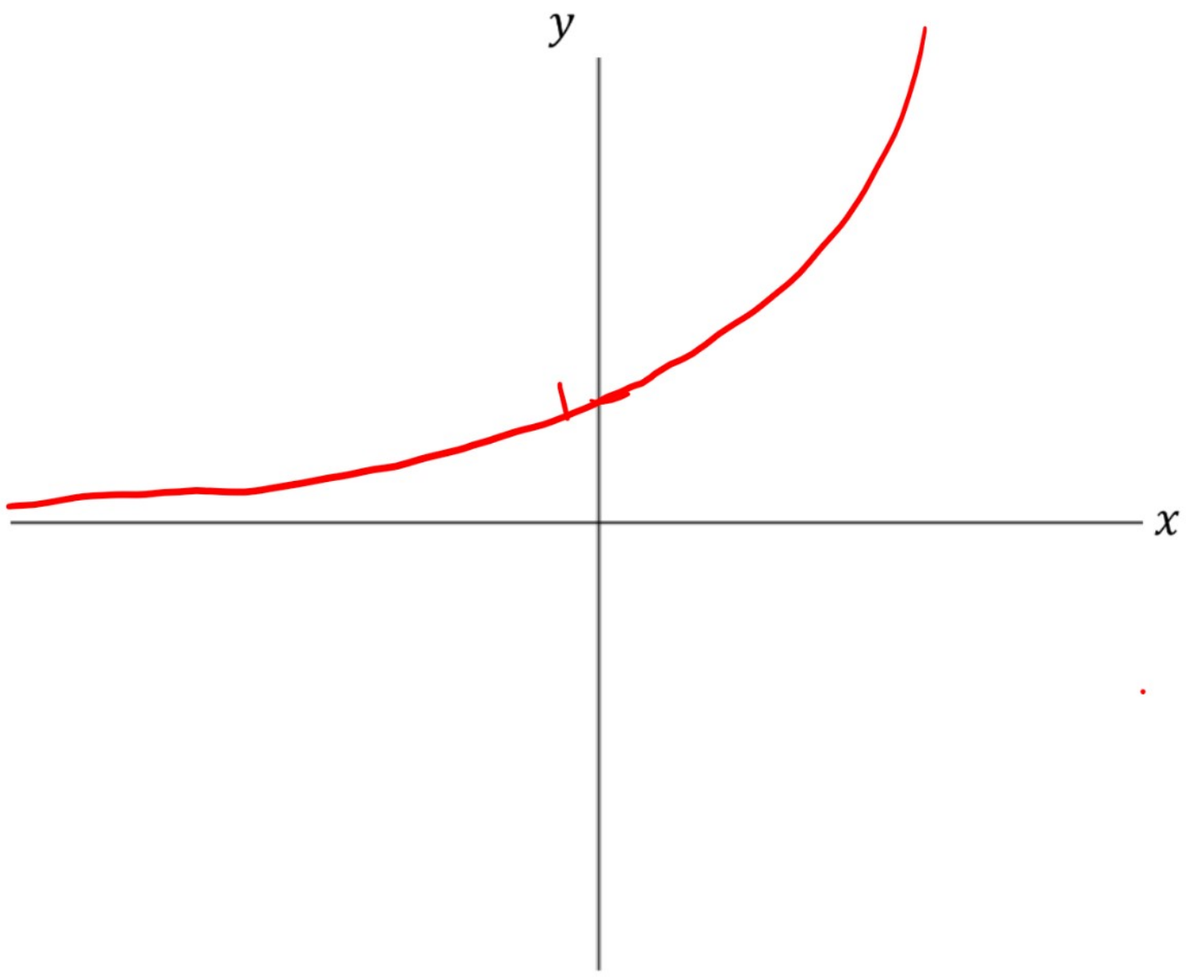
b) Solve the equation cos(x) = -1 in the range $-180° \leq x \leq 600°$.

$-180°$, $180°$, $540°$

Answer: $-180°$, $180°$, $540°$

(2 marks)

Q3. a) Draw the graph of $y = 2^x$ on the axes below. Label any points of intersection with the co-ordinate axes.



b) State whether or not the point (10, 1000) lies on the curve.

$1000 \neq 2^{10}$

So not on the Curve

Answer: no

(1 mark)

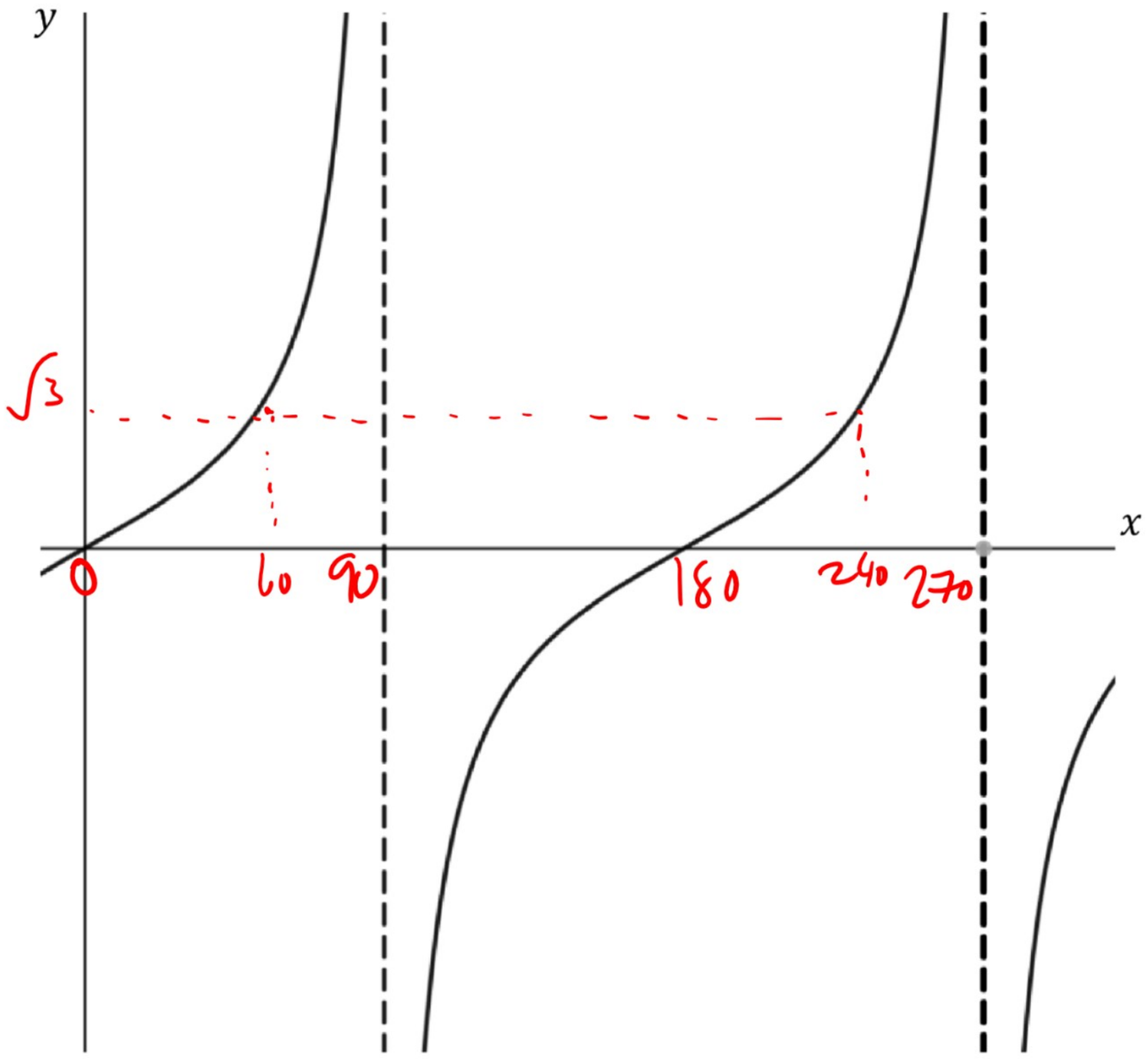
c) State any solution of the equation $2^x = 3^x$

$x = 0$

Answer: $x = 0$

(1 mark)

Q4. Here is a part of a graph of $y = \tan(x)$.



a) Label the points where the graph meets the x-axis

(2 marks)

b) Label the co-ordinates where the vertical asymptotes meet the x-axis

(2 marks)

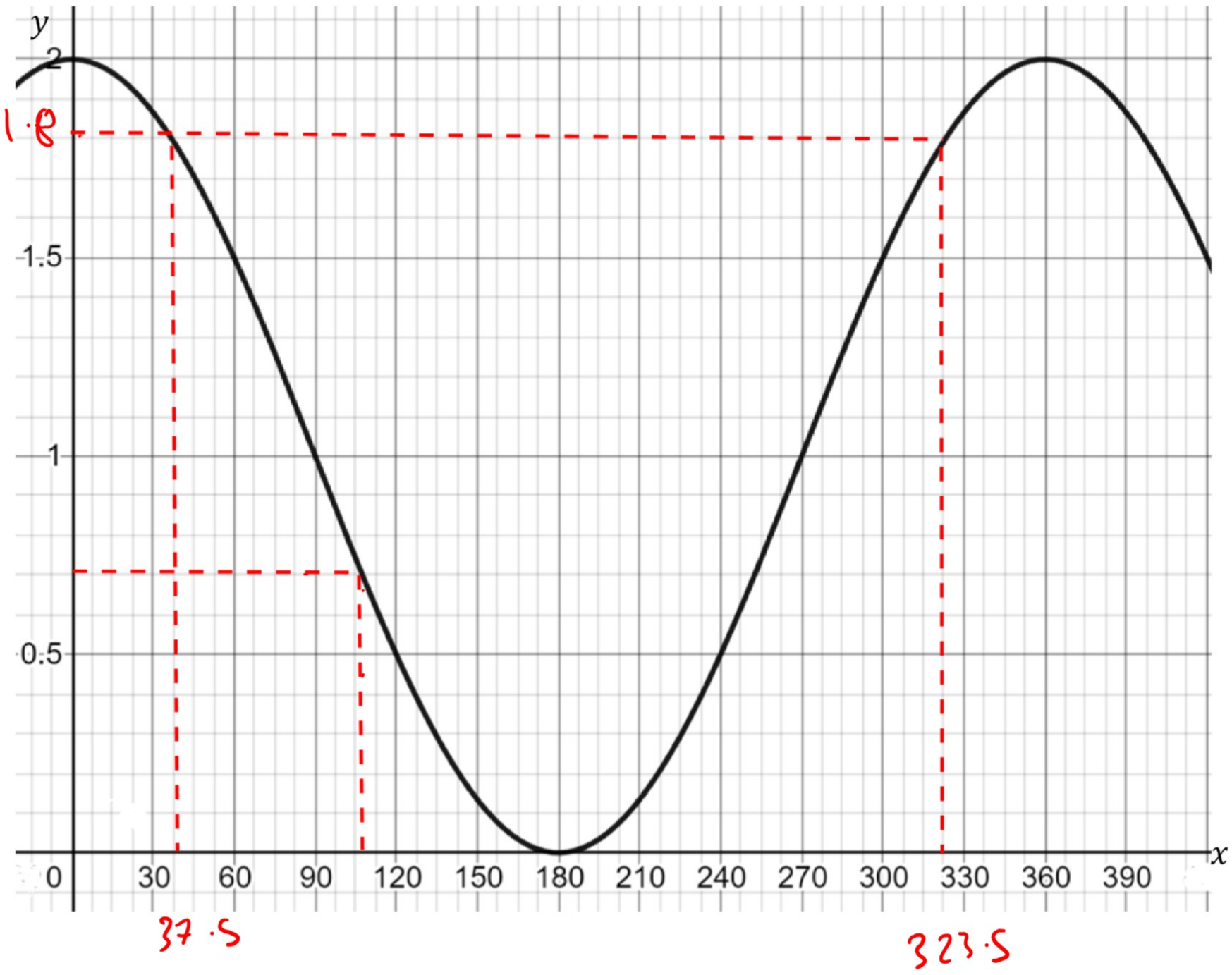
c) You are given that $x = 60°$ is a solution of the equation, $\tan(x) = \sqrt{3}$. State another solution of this equation in the range shown by the diagram.

$x = 240°$

Answer: 240° _____

(1 mark)

Q5. Below is a graph of y = cos (*x*) + 1



Use the graph to estimate the solution of the following equations:

(i) cos(x) + 1 = 0.7 where $0° \leq x \leq 360°$

Answer: 105°

(1 mark)

(ii) cos(x) = 2.8 where $0° \leq x \leq 420°$

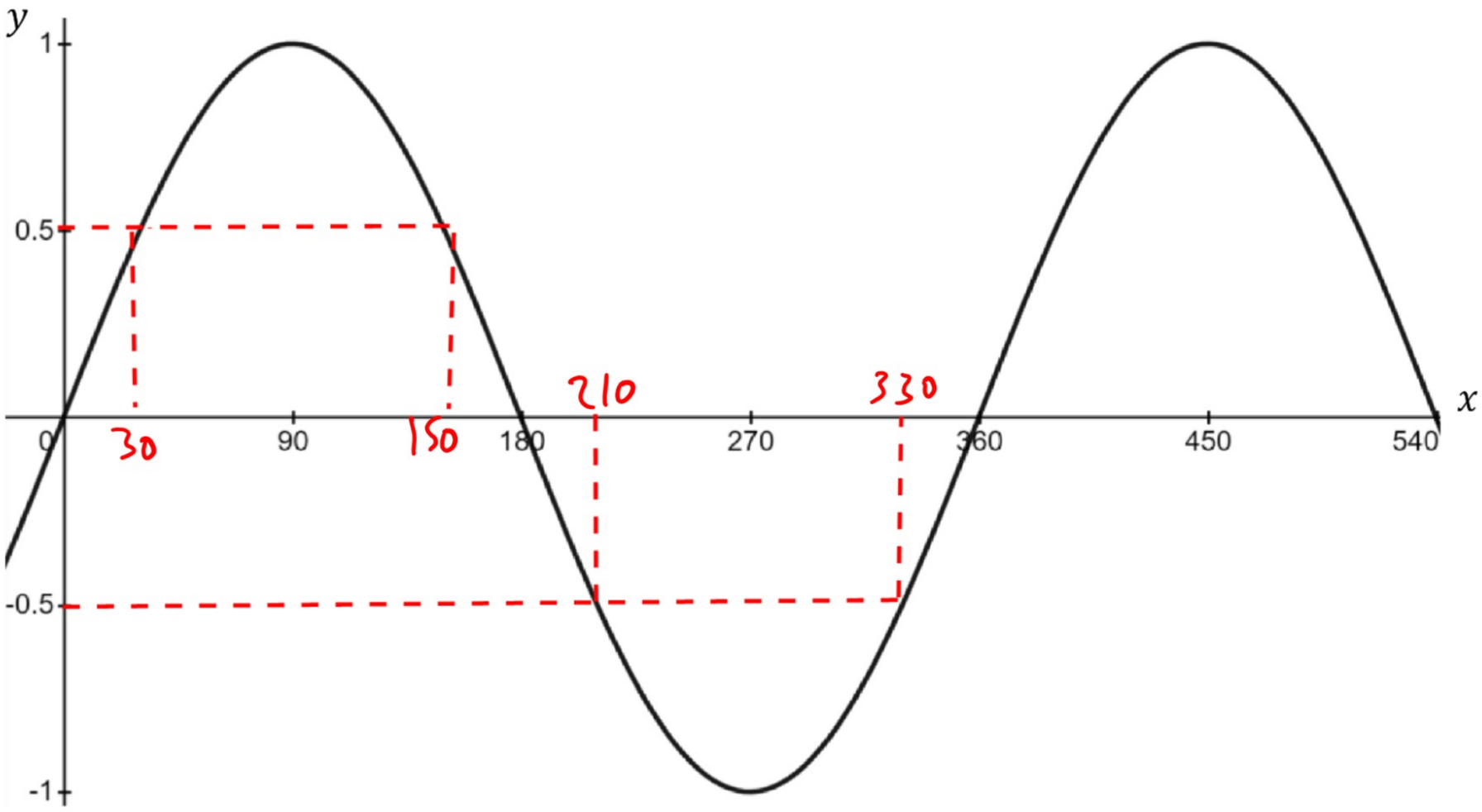
cos(x) + 1 = 1.8

x = 37.5, 323.5

Answer: 37.5°, 323.5°

(2 marks)

Q6. Here is a sketch of y = sin (x)



a) Given that sin(30°) = 0.5, find the value of

(i) sin(150°) = 0.5

Answer: 0.5

(1 mark)

(ii) sin(330°) = -0.5

Answer: -0.5

(1 mark)

b) How many solutions does the equation sin(x) = $\frac{x}{100}$ have in the region shown? Justify your answer.

2 solutions. The first is at $x = 0$.

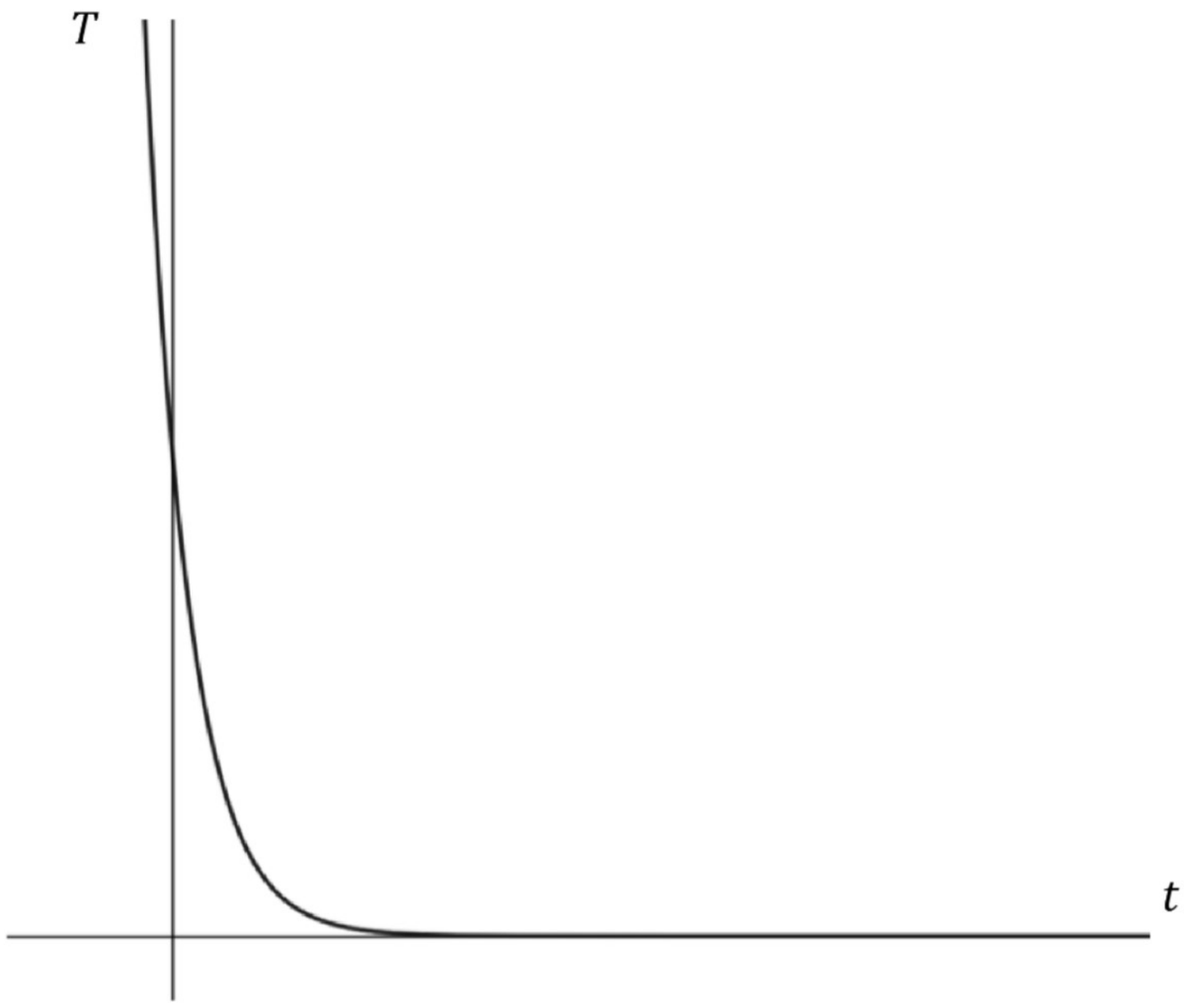
let $x = 90$, then $\sin x = 1$ whilst $\frac{x}{100} = 0.9$, so $y = \frac{x}{100}$ will intersect $y = \sin(x)$ once again during the period $0 < x < 180$

Answer: 2 solutions

(2 marks)

Applied Mixed Problems

Q7. The temperature T °C of a cup of coffee left in an office t minutes after it was made is modelled by the equation $T = 60(2^{-t})$. A sketch of the equation is below:



a) State the initial temperature of the cup of coffee.

$t = 0 \Rightarrow T = 60(2^{-0})$

$= 60$

Answer: 60°

(1 mark)

b) Work out the temperature of the coffee after 3 minutes

$T = 60(2^{-3})$

$= 60 \times \frac{1}{8}$

$= 7.5$

Answer: 7.5°

(1 mark)

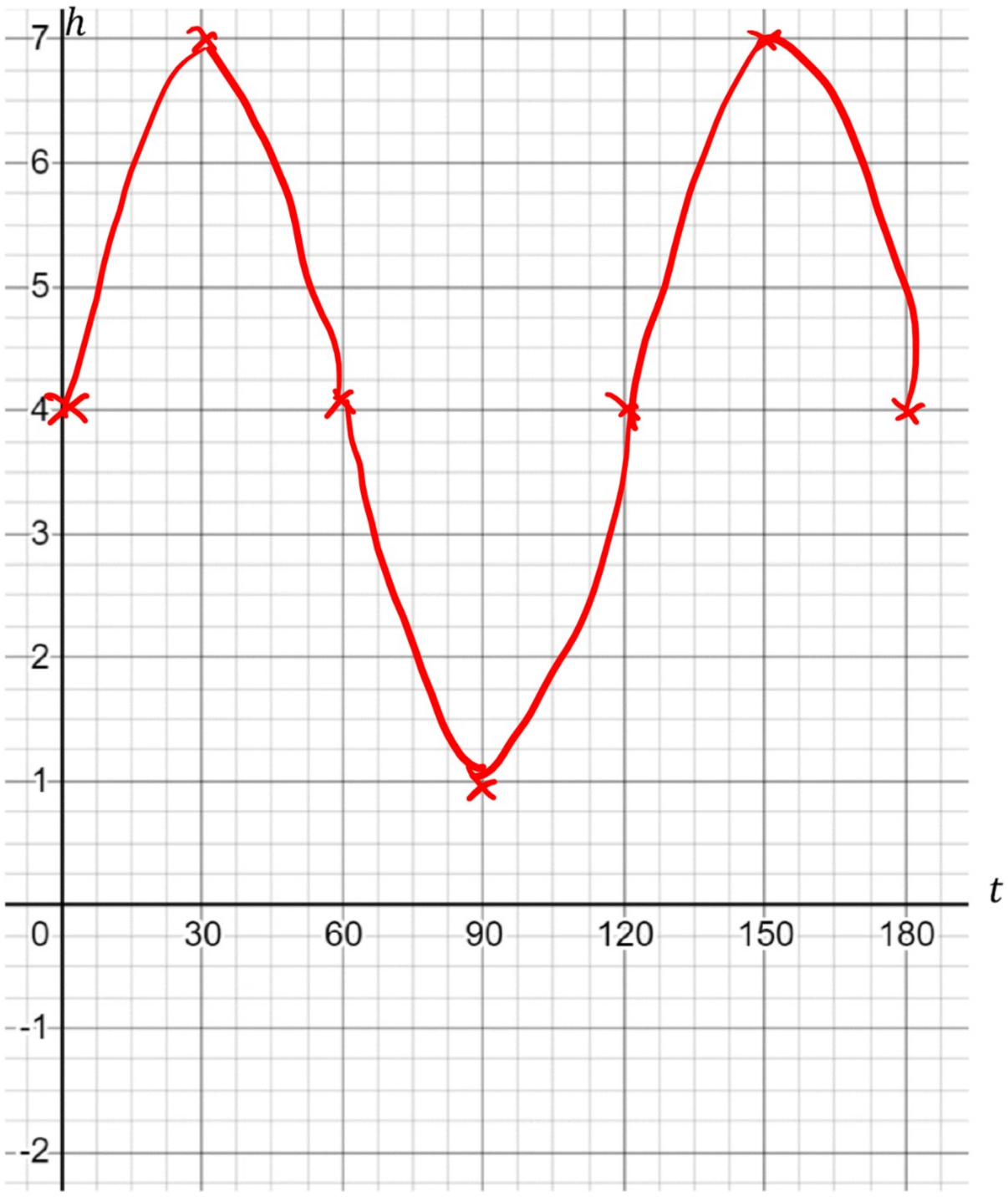
c) State two criticisms of the model.

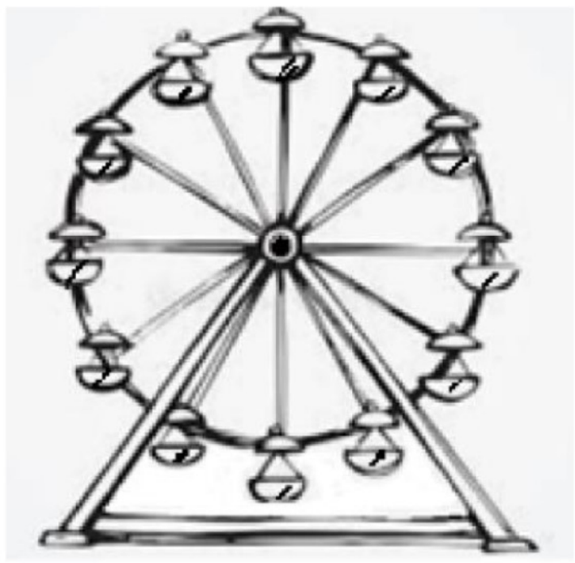
- The model includes negative values of time t
- The model suggests that the temperature will be eventually close to 0°C, which is too cold for an office.

Answer:

(2 marks)

Q8. The height h (metres) of a person above ground on a fairground wheel at t seconds after the ride starts is modelled by the equation, $h = 4 + 3\sin(3t)$





a) Draw the graph of h for $0° \leq t \leq 180°$

(2 marks)

b) Work out how many seconds it takes for the person to ride one complete turn of the wheel.

From the graph, the entry height of 4m occurs again after 120 s,

or $\frac{360}{3} = 120°$

Answer: 120°

(2 marks)

c) An alternative model is proposed: $h = \sin(500t)$.
State one advantage of this model compared to the first model, and one disadvantage of this model compared to the first model.

advantage: the entry height to the ride is lower (ground level) rather than at 4m.

Disadvantage: the ride is too fast, revolving in less than 1 second.

Answer: _____

(2 marks)