**Mathematics Methods Unit 1 (2018)**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Test 2B**

**Topic 2: Trigonometric Functions and Equations**

**Total time allowed: 37 minutes. Total marks: 33 marks**

**Section One:**

**Calculator-free**

Time allowed for this section: 17 minutes

Total marks for this section: 15 marks

**Materials required for this section:**

SCSA Formula Sheet

**Instructions to candidates**

Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

|  |  |
| --- | --- |
| **Question 1** | **[2 marks]** |

Show that using an angle sum identity.

|  |  |
| --- | --- |
| **Question 2** | **[3, 3, 3 = 9 marks]** |

Solve the following equations.

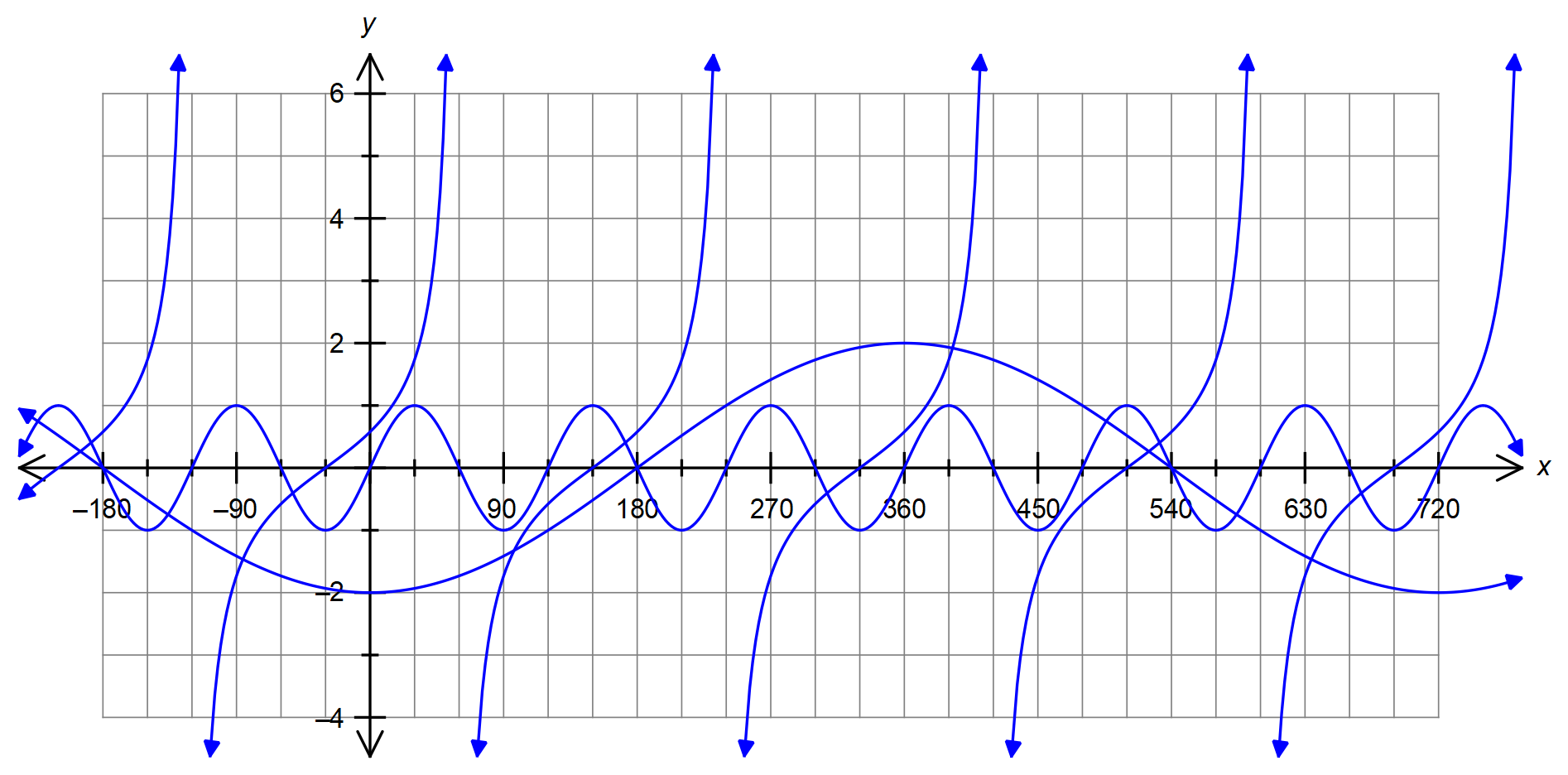
a) where

b) where

c) where

|  |  |
| --- | --- |
| **Question 3** | **[4 marks]** |

The graphs of , and , are given below.



Determine the values of and .

**Mathematics Methods Unit 1 (2018)**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Test 2B**

**Topic 2: Trigonometric Functions and Equations**

**Section Two:**

**Calculator-assumed**

Time allowed for this section: 20 minutes

Total marks for this section: 18 marks

**Materials required/recommended for this section:**

SCSA Formula Sheet

Notes on one sheet (both sides) of A4 paper

Up to three approved calculators

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|  |  |
| --- | --- |
| **Question 4** | **[4 marks]** |

Angles A and B are both obtuse angles such that and .

Determine the exact value for

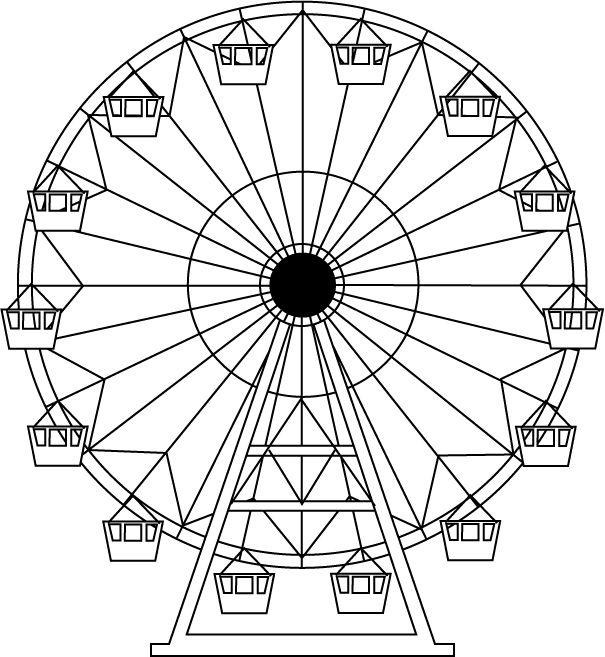
|  |  |
| --- | --- |
| **Question 5** | **[4, 2 = 6 marks]** |

a) Show that .

b) Hence or otherwise, solve where

|  |  |
| --- | --- |
| **Question 6** | **[1, 4, 1, 2 = 8 marks]** |

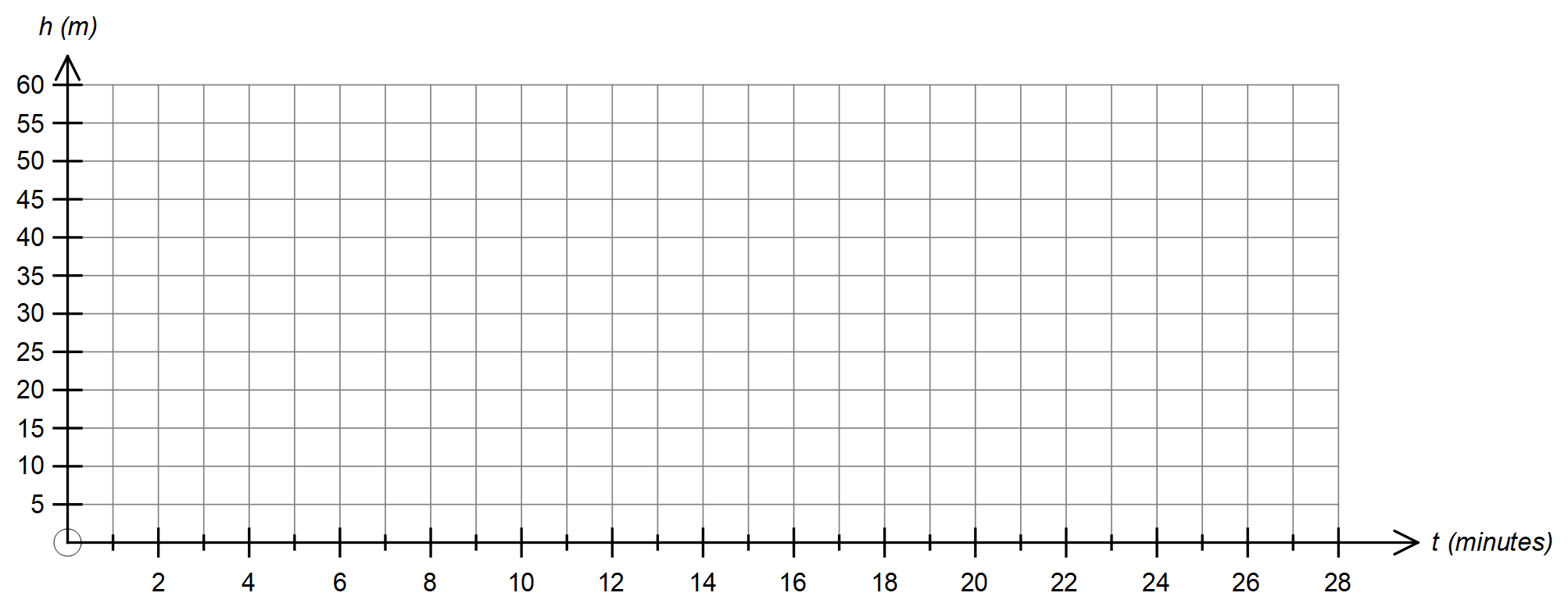
The height above the ground of a carriage on the circumference of large Ferris wheel is given by the following function.

[](https://www.google.com.au/url?sa=i&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwjBotrz_6XbAhUBnJQKHeV0Ab0QjRx6BAgBEAU&url=https://www.pinterest.com/pin/139259813452458791/&psig=AOvVaw2jslj2Yf9wrh8Hn0ABR-4a&ust=1527514011201837)

Where the height is in metres and the time is in minutes.

a) Determine the height of the carriage above the ground when .

b) Sketch the graph of on the axes below for .



c) How long does the Ferris wheel take to rotate once?

d) The view from the Ferris wheel carriage is uninterrupted (best) when the height of the carriage is at least 36 metres

above the ground. For how long does the carriage enjoy uninterrupted views if the Ferris wheel rotates twice.

**Mathematics Methods Unit 1 (2018)**

Name: \_\_\_**SOLUTIONS**\_\_\_\_\_\_\_\_

**Test 2B**

**Topic 2: Trigonometric Functions and Equations**

**Total time allowed: 37 minutes. Total marks: 33 marks**

**Section One:**

**Calculator-free**

Time allowed for this section: 17 minutes

Total marks for this section: 15 marks

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|  |  |
| --- | --- |
| **Question 1** | **[2 marks]** |

Show that using an angle sum identity.

✓ uses correct angle sum identity

✓ simplifies to show that which is required

|  |  |
| --- | --- |
| **Question 2** | **[3, 3, 3 = 9 marks]** |

Solve the following equations.

a) where

✓rearranges equation

✓two solutions ✓ in correct domain

b) where

Solving for over the domain

where

✓obtains two correct solutions for

✓ solves for over to obtain all four correct solutions

✓ solves for by dividing by 2

c) where

✓ uses angle difference identity

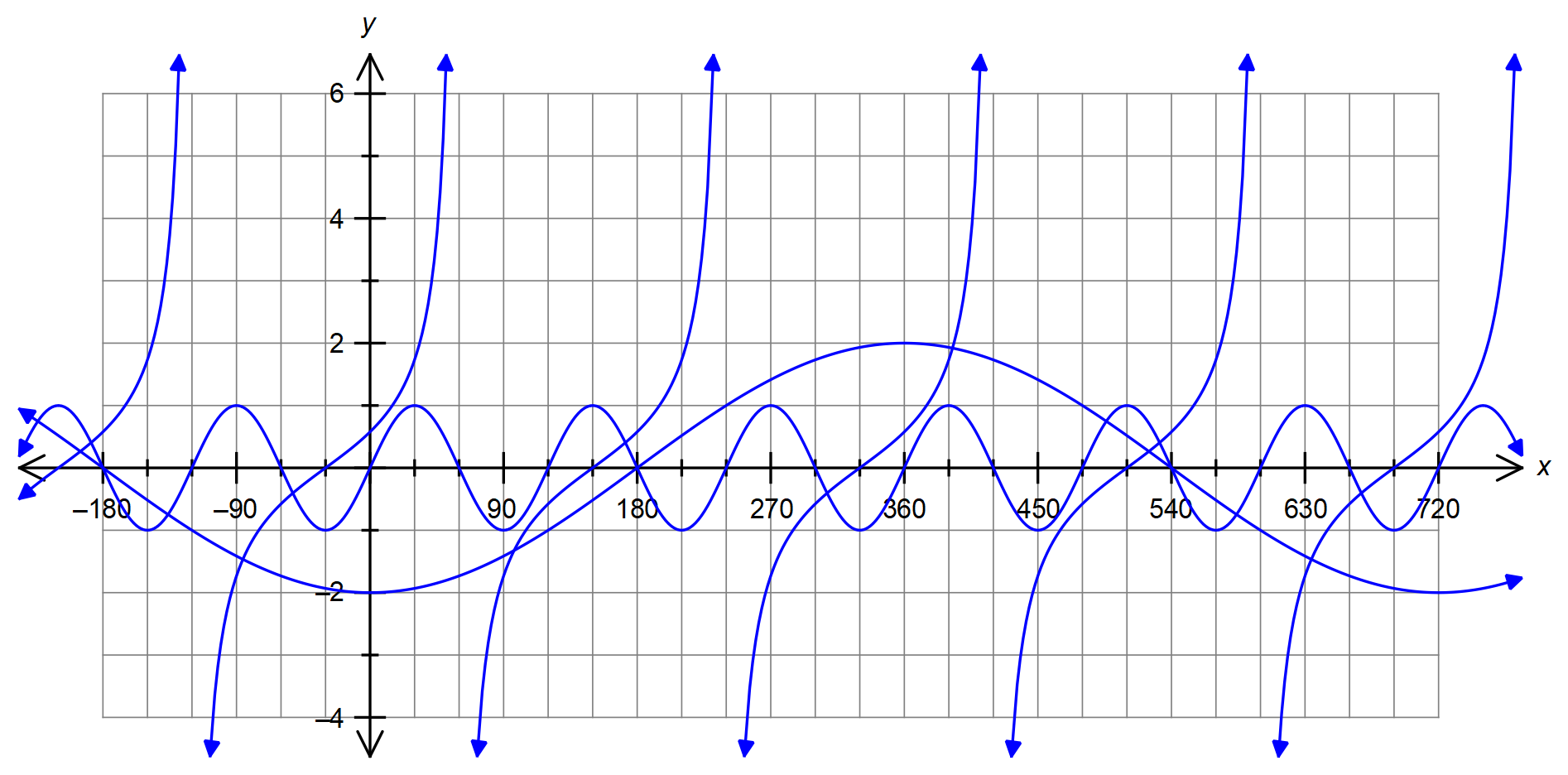
Solving for over the domain

✓ solves for between – 40° and 320°

✓solves for *x* solution by adding 40°

|  |  |
| --- | --- |
| **Question 3** | **[4 marks]** |

The graphs of , and , are given below.



Determine the values of and .

✓

✓

✓

✓

**Mathematics Methods Unit 1 (2018)**

Name: \_\_\_**SOLUTIONS**\_\_\_\_\_\_\_\_

**Test 2B**

**Topic 2: Trigonometric Functions and Equations**

**Section Two:**

**Calculator-assumed**

Time allowed for this section: 20 minutes

Total marks for this section: 18 marks

**Materials required/recommended for this section:**

SCSA Formula Sheet

Notes on one sheet (both sides) of A4 paper

Up to three approved calculators

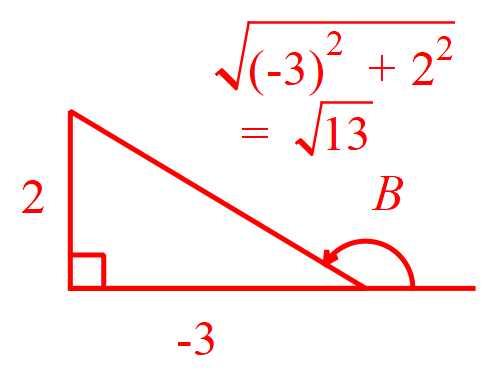
**Instructions to candidates**

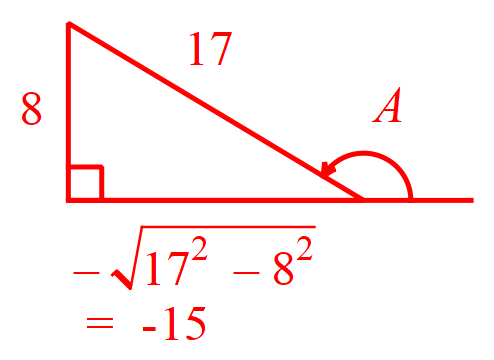
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|  |  |
| --- | --- |
| **Question 4** | **[4 marks]** |

Angles A and B are both obtuse angles such that and .

Determine the exact value for

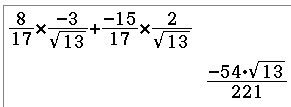




✓ uses angle sum identity

✓ determines exact value for

✓ determines exact values for and



✓ determines exact value

required

|  |  |
| --- | --- |
| **Question 5** | **[4, 2 = 6 marks]** |

a) Show that .

✓ shows -75° as -45° – 30°

✓ uses angle difference identity

✓ uses exact values for sin, cos -45° and 30°

✓ simplifies and factorises to show that which is required

b) Hence or otherwise, solve where

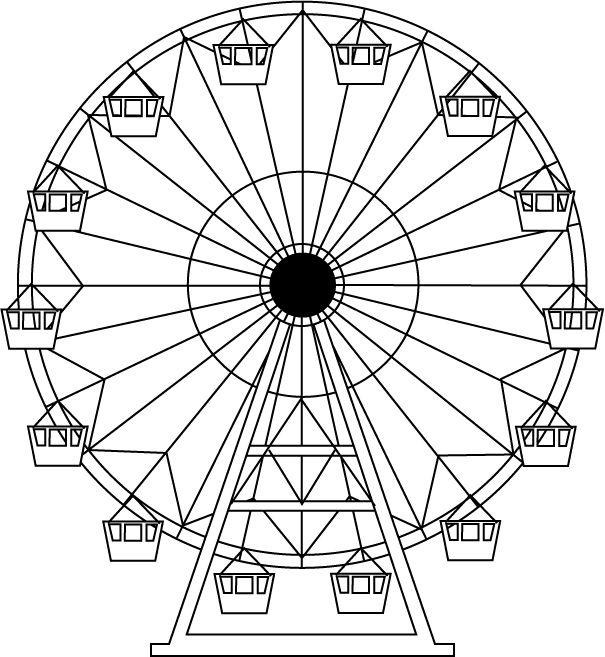


(no mark) rearranges equation or uses CAS to solve

✓one correct solution ✓ all three correct solutions

|  |  |
| --- | --- |
| **Question 6** | **[1, 4, 1, 2 = 8 marks]** |

The height above the ground of a carriage on the circumference of large Ferris wheel is given by the following function.

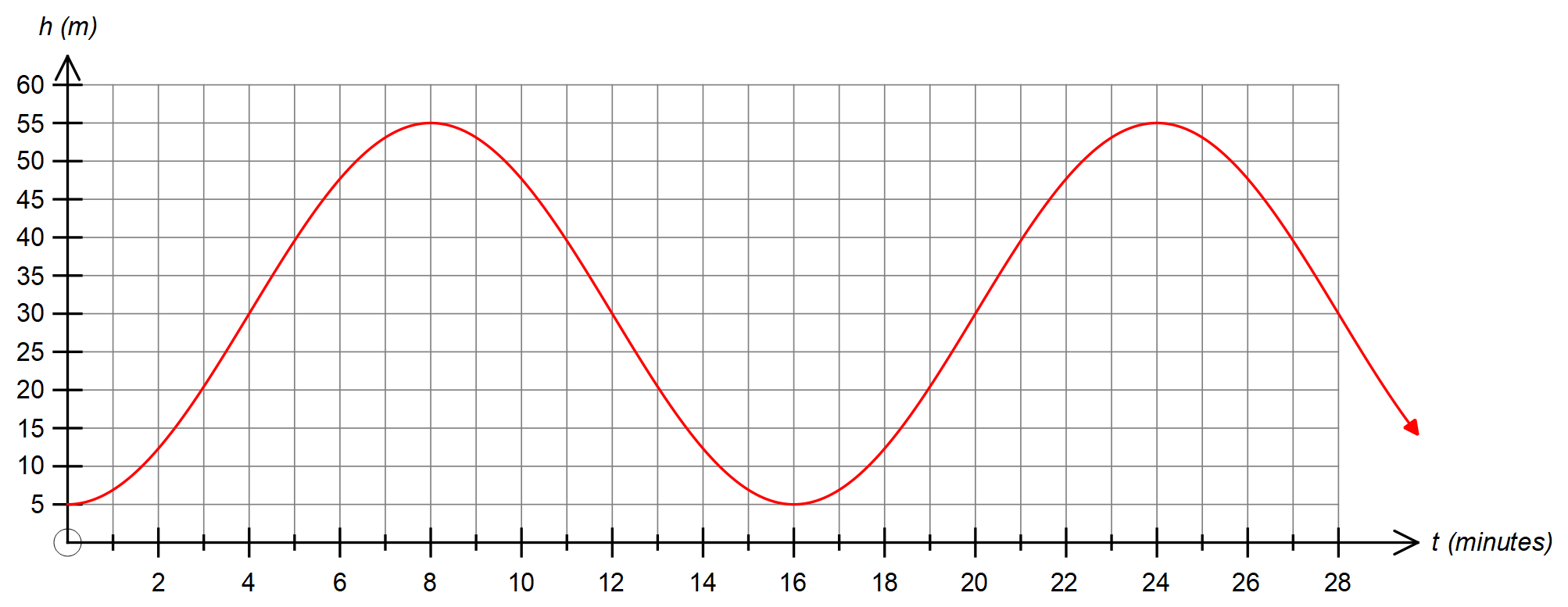
[](https://www.google.com.au/url?sa=i&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwjBotrz_6XbAhUBnJQKHeV0Ab0QjRx6BAgBEAU&url=https://www.pinterest.com/pin/139259813452458791/&psig=AOvVaw2jslj2Yf9wrh8Hn0ABR-4a&ust=1527514011201837)

Where the height is in metres and the time is in minutes.

a) Determine the height of the carriage above the ground when .

metres ✓ correct height

b) Sketch the graph of on the axes below for .



✓ ✓ minimums at (0, 5) and (16, 5)

✓ maximums at (8, 55) and (24, 55) ✓ smooth curve through above points, no abrupt ‘corners’

c) How long does the Ferris wheel take to rotate once?

16 minutes ✓ correct time

d) The view from the Ferris wheel carriage is uninterrupted (best) when the height of the carriage is at least 36 metres

above the ground. For how long does the carriage enjoy uninterrupted views if the Ferris wheel rotates twice.

Solve

CAS ✓ solves for height of 36 metres

Time spent at least 36 metres above the ground minutes

✓ determines time in minutes to at least 1 d.p. rounding down.