MATHEMATICAL METHODS (CAS)

Unit 2
Targeted Evaluation Task for School-assessed Coursework 1

2015 Multiple choice and extended response test on circular functions for Outcome 1

SOLUTIONS & RESPONSE GUIDE

Total marks for this task = 40
Note: Student marks must be divided by 4 to give the correct marks for the outcomes.

Allocation of marks for Outcomes
Outcome 1 = 10 marks

SECTION A: Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

$$225 \times \frac{\pi}{180} = \frac{5\pi}{4}$$

Question 2

Answer: B

Explanation:

Sketch on CAS and read the maximum value.

Question 3

Answer: A

Explanation:

$$Period = \frac{\pi}{1/4} = 4\pi$$

Question 4

Answer: D

Explanation:

$$\tan(2\theta) = -\frac{1}{\sqrt{8}}, \quad \cos(2\theta) = \frac{\sqrt{8}}{3}$$

Question 5
Answer: A

Explanation:

Solve on CAS over the restricted domain.

Question 6
Answer: D

Explanation:

$$Period = \frac{2\pi}{2/\pi} = \pi^2$$

Question 7
Answer: A

Explanation:

Domain is given in the function form and range is all real numbers.

Question 8
Answer: C

Explanation:

$$\frac{x-3}{2} = \frac{\pi}{2} \Rightarrow x = \pi + 3$$
$$Period = 2\pi$$
$$Asymptote = \pi + 3 + 2\pi$$

Question 9
Answer: E

Explanation:

$$Range = \left[1 - \frac{2}{3}, 1 + \frac{2}{3}\right]$$

Question 10
Answer: A

Explanation:

Solve on CAS.

Question 11
Answer: D

Explanation:
$Period = \frac{5\pi}{3}$
$x = \frac{5\pi}{6} - \frac{5\pi}{3}$

Question 12
Answer: B

Explanation:
Solve $\sin(\pi a) = \frac{1}{2}$ for a

Question 13
Answer: C

Explanation:
Find the value on CAS.

Question 14
Answer: D

Explanation:
$Period = \pi$
$Translation\ \ of\ \ 1\,unit\ \ down$

Question 15
Answer: B

Explanation:
Put $x = 0$

Question 16
Answer: A

Explanation :
Solve on CAS over restricted domain

Question 17
Answer: D

Explanation:
$\cos(90° + \theta) = -\sin(\theta)$
$\sin(\theta) = -0.2851$

Question 18
Answer: C

Explanation :
$g(x) = -\sin(-x) + 2$.

Question 19
Answer: A

Explanation:
Define the two functions on CAS and find the composite function.

Question 20
Answer: E

Explanation:
Note that there is no dilation from the x-axis.

SECTION B- Extended response questions

Question 1

a. $x(0) = 2m$

1 mark

b. $Period = \dfrac{2\pi}{\pi/24} = 48 \text{ sec}onds$

2 marks

c. $x(4) = 2.804m$

2 marks

d. $x(t) = 9, \quad over \quad 0 \le t \le 192$

$t = 13.28, 34.72, 61.28, 82.72, 109.28, 130.72, 157.28, 178.72$

3 marks

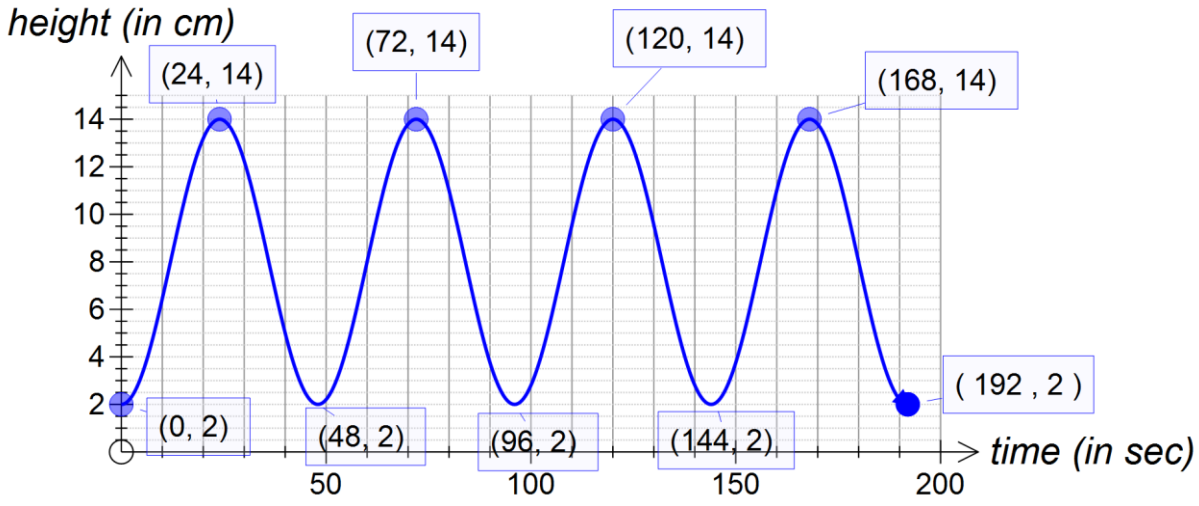
e. $\dfrac{x(5) - x(0)}{5 - 0} = 0.25 \; m/\text{sec}$

2 marks

f. $Max = 14 \; m$

1 mark

g.



4 marks

Question 2

a. $\dfrac{\pi}{\pi / n} = 12$

$n = 12$

2 marks

b.

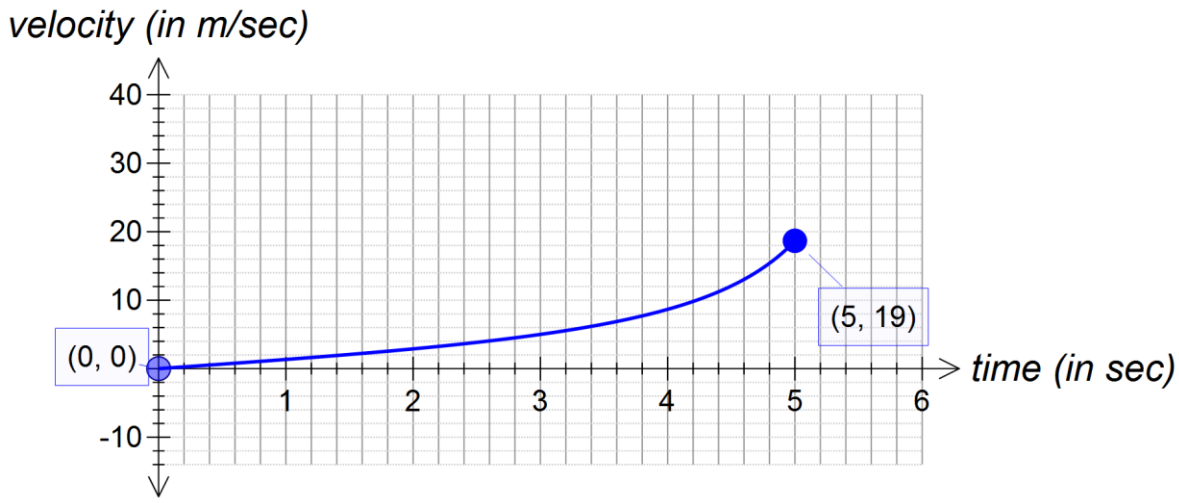
$v(t) = a\tan\left(\dfrac{\pi t}{12}\right)$

$5 = a\tan\left(\dfrac{3\pi}{12}\right)$

$a = 5$

1 mark

c.



2 marks