

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

Student #: \_\_\_\_\_

Date: \_\_\_\_\_

T.A. #: \_\_\_\_\_

## Mathematics 12 Pre-Calculus LEARNING GUIDE 8 TEST – TRIG FUNCTIONS

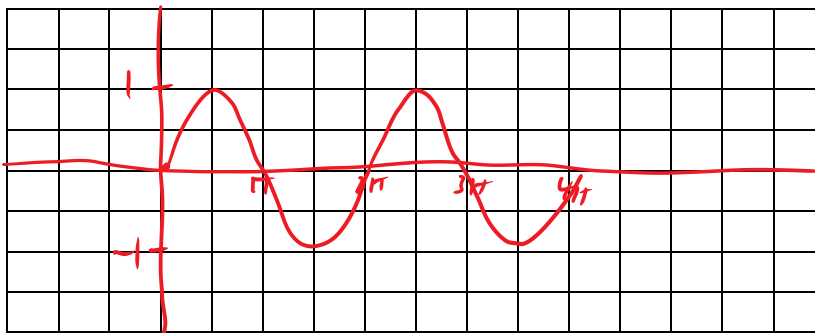
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### \*GRAPHING CALCULATORS ARE NOT PERMITTED ON THIS PART OF THE TEST\*

When using a calculator, you should provide a decimal answer that is correct **to at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

1. For  $y = \sin x$ ,
  - a) Graph at least 2 complete cycles. (1 mark)
  - b) State the x and y intercepts. (1 mark)
  - c) State the domain and range. (1 mark)
  - d) State the maximum and minimum values of y. (1 mark)
  - e) State the values of x for which the maximum y values occur. (1/2 mark)
  - f) State the values of x for which the minimum y values occur. (1/2 mark)

$$y = \sin x$$



$$x\text{-int: } n\pi, n \in \mathbb{Z}$$

$$y\text{-int: } 0$$

$$D: x \in \mathbb{R}$$

$$R: -1 \leq y \leq 1$$

$$\text{MAX: } 1 \text{ AT } x = \frac{\pi}{2} + n2\pi, n \in \mathbb{Z}$$

$$\text{MIN: } -1 \text{ AT } x = \frac{3\pi}{2} + n2\pi, n \in \mathbb{Z}$$

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2. For  $y = \cos x$ ,
- g) Graph at least 2 complete cycles. (1 mark)
  - h) State the x and y intercepts. (1 mark)
  - i) State the domain and range. (1 mark)
  - j) State the maximum and minimum values of y. (1 mark)
  - k) State the values of x for which the maximum y values occur. (1/2 mark)
  - l) State the values of x for which the minimum y values occur. (1/2 mark)

$y = \cos x$



$x$  int:  $\frac{\pi}{2} + n\pi, n \in \mathbb{Z}$

$y$  int: 1

D:  $x \in \mathbb{R}$

R:  $-1 \leq y \leq 1$

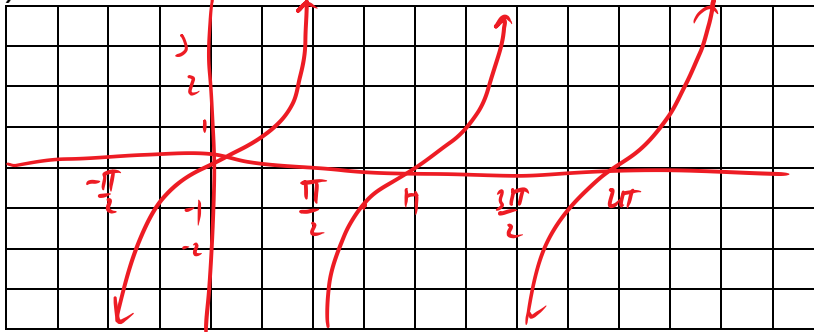
MAX: 1 AT  $x = n2\pi, n \in \mathbb{Z}$

MIN: -1 AT  $x = \pi + n2\pi, n \in \mathbb{Z}$

3. For the function  $y = \tan x$ ,

- a) Graph at least 2 complete cycles. (1 mark)
- b) State the x and y intercepts. (1 mark)
- c) State the domain and range. (1 mark)

$y = \tan x$



$x$  int:  $n\pi, n \in \mathbb{Z}$

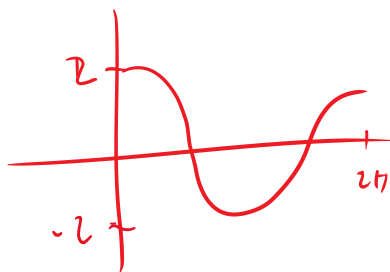
$y$  int: 0

D:  $x \in \mathbb{R}, x \neq \frac{\pi}{2} + n\pi, n \in \mathbb{Z}$

R:  $y \in \mathbb{R}$



6. Determine an equation of the form  $f(x) = 2 \cos(x - b) + c$  that has a maximum value of 1 when  $x = \frac{\pi}{2}$ . (2 marks)



Right  $\frac{\pi}{2}$

down 1

$$f(x) = 2 \cos\left(x - \frac{\pi}{2}\right) - 1$$

**GRAPHING CALCULATORS ARE PERMITTED ON THIS PORTION OF THE TEST.**

**\*Full marks will NOT be given for the final answer only.**

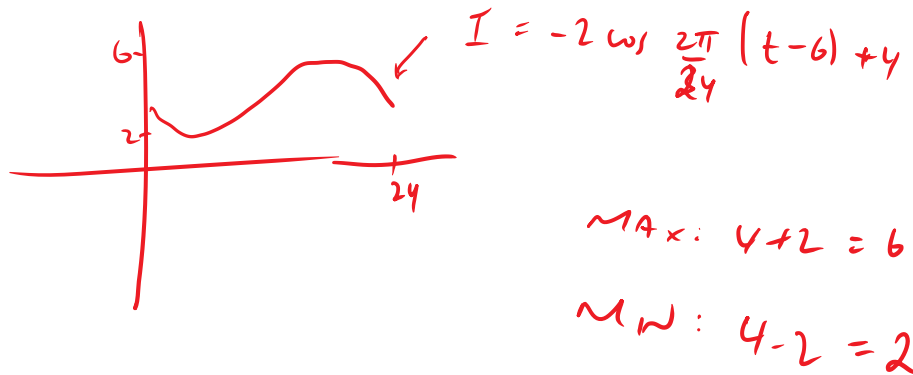
If, in a justification, you refer to information produced by the graphing calculator, this information must be presented clearly in the response. For example, if a graph is used in the solution of the problem, it is important to sketch the graph, show the equation(s) used and how you used the graph(s) to determine the solution(s).

When using a calculator, you should provide a decimal answer that is correct **to at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

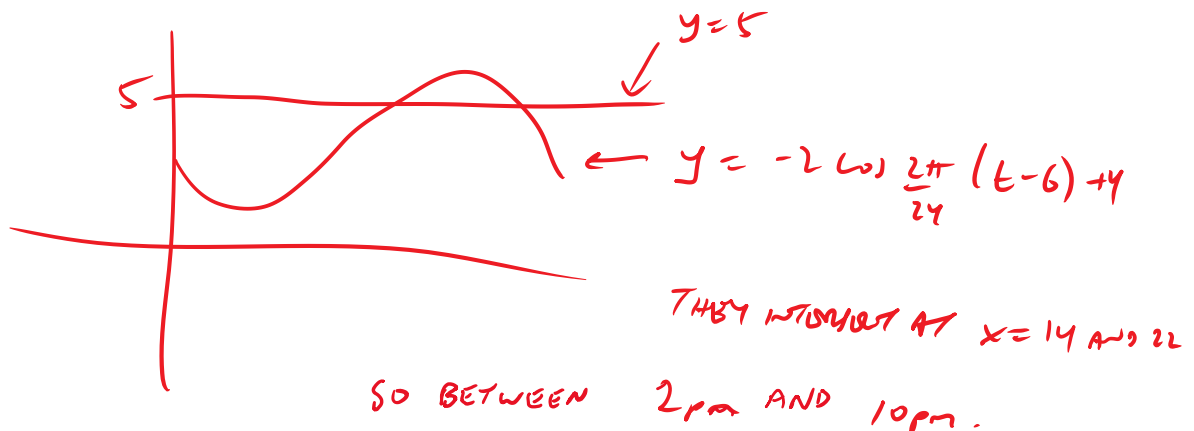
7. The air quality index,  $I$ , in a large city can be modelled by the equation

$$I = -2 \cos \frac{2\pi}{24}(t - 6) + 4, \text{ where } t \text{ represents the time, in hours, after midnight.}$$

a) What are the current minimum and maximum values of the index in the city? (1 mark)

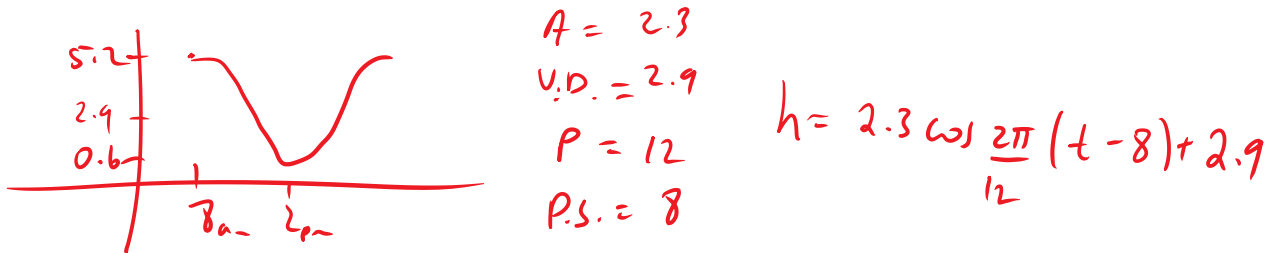


b) If an air quality alert is issued for times when the index is above 5, during what time period will an air quality alert be issued? (1 mark)



8. At a certain ocean bay, the high tide of 5.2m occurs at 8:00 a.m. The next low tide of 0.6m occurs at 2:00pm. Assume that the relationship between the height,  $h$ , in metres, and the time,  $t$ , in hours, is sinusoidal.

- a) Write an equation that expresses the height of the water as a function of time. (2 marks)



- b) Calculate the height of the water at 10am. (1 mark)

$$h = 2.3 \cos \frac{2\pi}{12} (10 - 8) + 2.9$$

$$= 4.05 \text{ m}$$

- c) A freighter needs a depth of at least 2m to safely dock. How many hours can the freighter tie up at the dock before it needs to cast off? (2 marks)

