

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

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

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

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

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

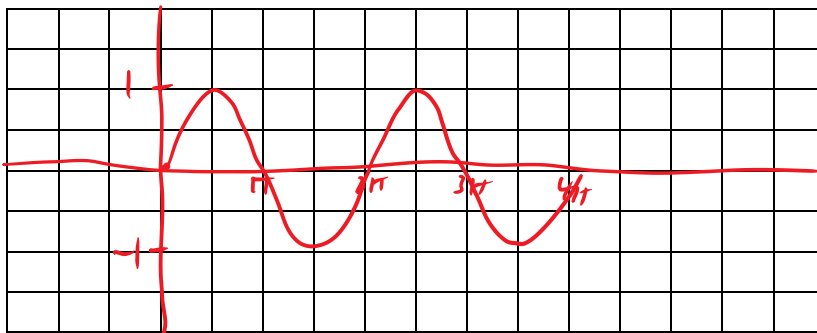
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**\*GRAPHING CALCULATORS ARE NOT PERMITTED ON THIS PART OF THE TEST\***

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)

$y = \sin x$



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

$y\text{-int: } 0$

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

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

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

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

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)

$y = \cos x$



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

$y \text{ int: } 1$

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

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

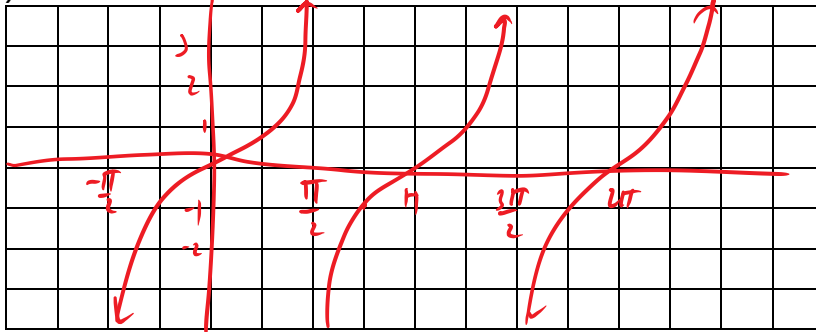
MAX: 1 at  $x = n2\pi, n \in \mathbb{Z}$

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)

$y = \tan x$



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

$y \text{ int: } 0$

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

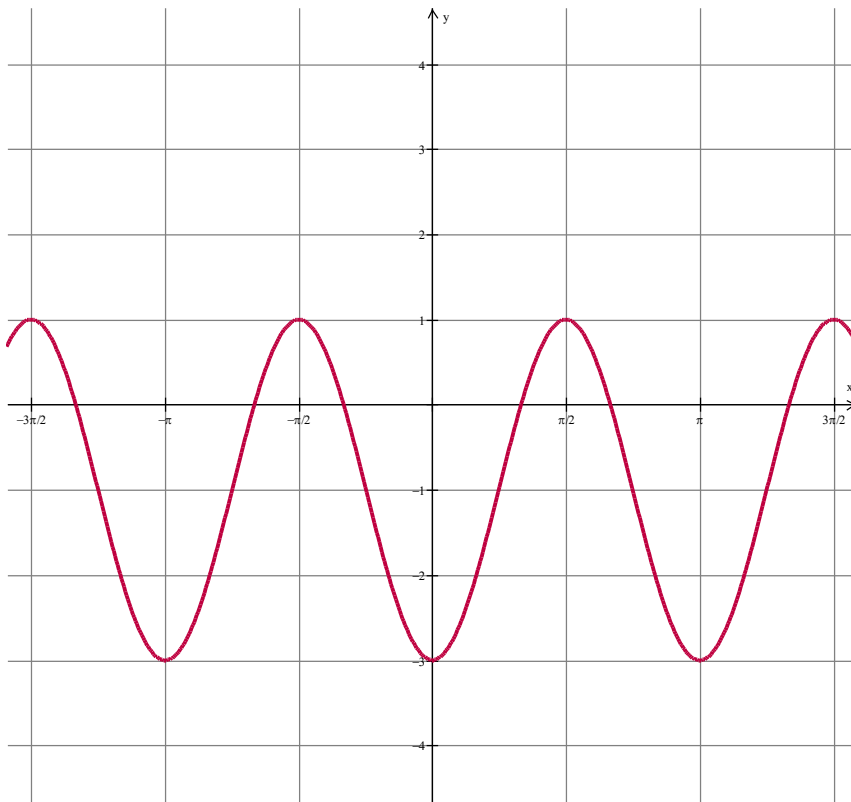
$R: y \in \mathbb{R}$

4. Describe the indicated attributes of the graph of  $f(x) = -\frac{1}{2} \cos 3(x + \pi) + 2$   
(4 marks)

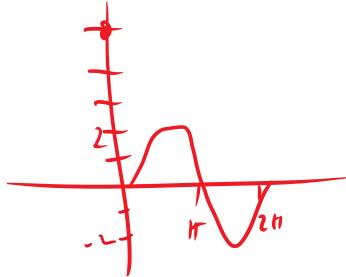
- a) Period  $\frac{2\pi}{3}$       b) phase shift LEFT  $\pi$   
 c) amplitude  $\frac{1}{2}$       d) vertical displacement 2

5. For the sine graph below, state the:

- a) period (1 mark)  $\pi$       b) domain (1 mark)  $x \in \mathbb{R}$   
 c) range (1 mark)  $-3 \leq y \leq 1$       d) possible phase shift (1 mark)  $\frac{\pi}{4}$  right  
 e) vertical displacement (1 mark) -1  
 f) Equation of the graph (2 marks)  $y = 2 \sin 2(x - \frac{\pi}{4}) - 1$



6. Determine an equation of the form  $f(x) = 2\sin(x - c) + d$  that has a maximum value of 5 when  $x = 0$ . (2 marks)



LEFT  $\frac{\pi}{2}$  & UP 3

$$f(x) = 2\sin\left(x + \frac{\pi}{2}\right) + 3$$

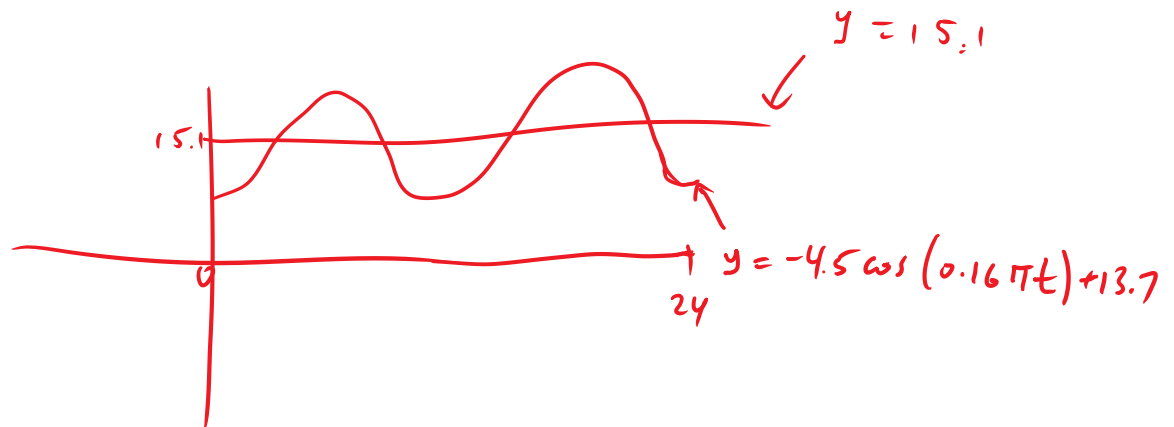
**GRAPHING CALCULATORS ARE PERMITTED ON THIS PORTION OF THE TEST.**

**\*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.

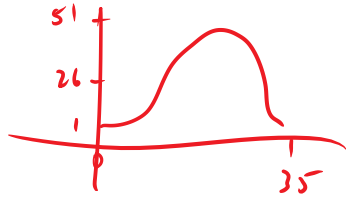
7. The depth of water in a harbour is given by the equation  $d(t) = -4.5 \cos(0.16\pi t) + 13.7$  where  $d(t)$  is the depth, in meters, and  $t$  is the time, in hours. When, in the first 24 hours, is the tide at a height of 15.1m? (2 marks)



THE SOLUTION WILL BE THE X-COORDINATE OF THE INTERSECTION POINTS ON THE DOMAIN  $0 \leq x \leq 24$ . THEY ARE:  $3.75 \text{ hrs}$ ,  $8.75 \text{ hrs}$ ,  $16.25 \text{ hrs}$   
 $\& 21.25 \text{ hrs}$

8. A Ferris wheel has a radius of 25m. It rotates once every 35 seconds. Passengers board the Ferris wheel at the bottom which is 1m above ground level. Suppose you get on the Ferris wheel at the bottom and the wheel starts to rotate.

a) Write an equation that expresses your height above ground level as a function of time. (2 marks)



$$v.o = 26$$

$$A = 25$$

$$P = 35$$

$$P.S. = 0$$

$$h = -25 \cos \frac{2\pi}{35} (t) + 26$$

$$\text{or } h = 25 \cos \frac{2\pi}{35} (t - 17.5) + 26$$

b) Calculate your height after 23 seconds. (1 mark)

$$h = -25 \cos \frac{2\pi}{35} (23) + 26$$

$$= 39.77 \text{ m}$$

c) Calculate one of the times when your height is 40m above the ground. (2 marks)

$$40 = -25 \cos \frac{2\pi}{35} (t) + 26$$

$$\frac{35 \cos^{-1} \left( \frac{26-40}{25} \right)}{2\pi} = t$$

$$t = 12.06 \text{ s } \& \text{ } 22.94 \text{ s}$$

(ONLY NEED 1 TIME).