

$\frac{\quad}{35+8+2} = \frac{\quad}{45}$
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Name: \_\_\_\_\_ Date: \_\_\_\_\_

**MHF4U**

**Test – Unit 5: Graphing Trigonometric Functions**

For questions 1-10, fill in the blanks with the correct answer. All answers should be exact. (1 mark each)

1. What is the maximum value of  $y = 4 \sin(x - \frac{\pi}{4}) - 1$ ? \_\_\_\_\_

2. Express  $\frac{7\pi}{5}$  radians in degree measure. \_\_\_\_\_

3. Express  $175^\circ$  in radian measure. \_\_\_\_\_

4. True or False: The range of  $y = \csc \theta$  is  $y \in R$ . \_\_\_\_\_

5. What is the reciprocal function of  $\tan \theta$ ? \_\_\_\_\_

6. State the restrictions of  $\frac{1}{\cos x}$ ,  $0 \leq x \leq 2\pi$ . \_\_\_\_\_

7. What is the period in radians for  $y = \tan 2\theta$ ? \_\_\_\_\_

8. What is the period of  $y = 2 \sin 3(\theta - \pi) - 1$ ? \_\_\_\_\_

9. What is the equation of the axis for the function  
 $y = -3 \cos\left(\theta + \frac{\pi}{2}\right) + 1$ ? \_\_\_\_\_

10. What is the arc length if the central angle is  $220^\circ$   
 and the radius is 8cm? \_\_\_\_\_

11. If  $\sin \theta = -\frac{2}{9}$ , where  $0 \leq \theta \leq 2\pi$ , evaluation in radians to the nearest hundredth. (4 marks)

12. A wheel has a diameter of 70cm and completes a revolution in 0.25 minutes at top speed.

a) Determine the angular velocity,  $\omega$ , in radians per second.

b) How far does the wheel travel in two minutes (meters)?

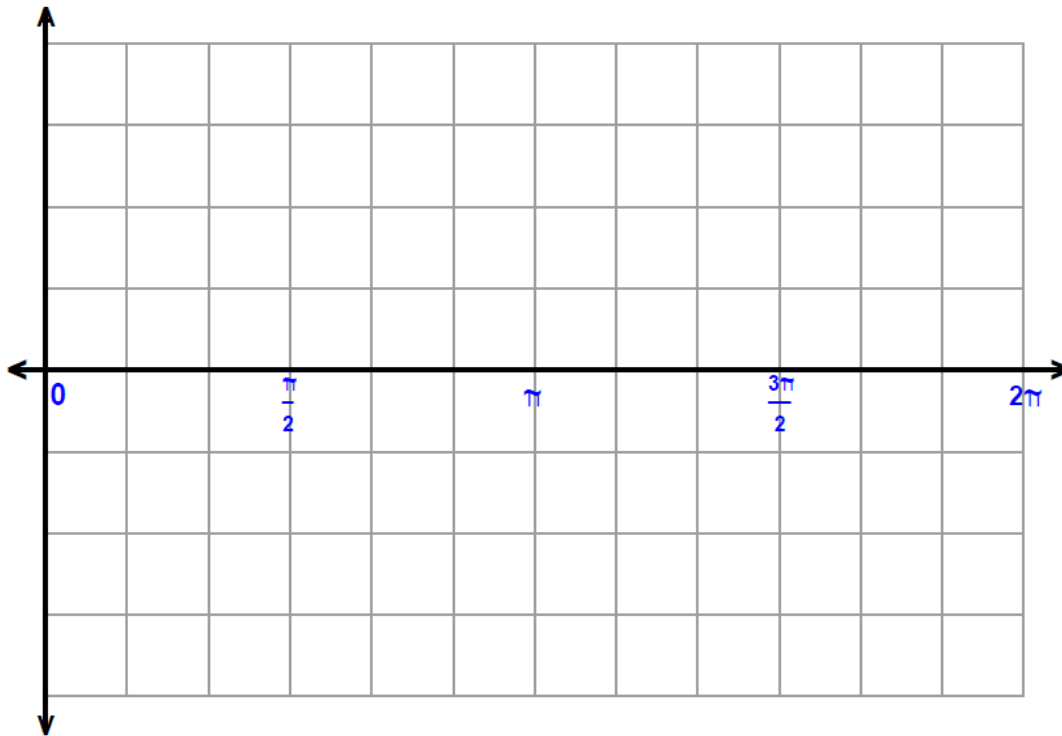
(4 marks)

13. An object that is suspended by a spring is 35cm off the floor when at rest. The weight is pulled to its lowest point and released which results in it oscillating up and down. The distance from the high point to the low point is 45cm and the object takes 2 seconds to complete 4 cycles. For the first few cycles, the motion is modeled by a sine function where distance from the ground  $d(t)$ , is measured in centimeters with respect to time, in seconds.

a) Sketch a graph of this function for two cycles. (3 marks)

b) Write a sine equation that describes the distance of the object from the ground as a function of time. (4 marks)

14. Graph one cycle of the following function on graph paper:  $y = 3\cos\left(2\theta - \frac{\pi}{3}\right) - 1$ .  
Show all work. (4 marks)



15. A kite is fastened to the ground by a string that is 45m long. If the angle of elevation of the kite is  $\frac{4\pi}{9}$ , determine the kite's height off the ground. (3 marks)

18. Tarzan is swinging on a vine at a constant rate. Jane is very smart and notices that his distance away from her can be modeled by the function  $d(t) = 3 \sin\left(\frac{\pi}{5}\left(t - \frac{1}{2}\right)\right) + 20$  where  $d(t)$  is the distance away from Jane in meters and  $t$  is time in seconds. **Explain** how you can find out how long it takes for Tarzan to complete one cycle of his swing. (3 marks)

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**Part 1** – No calculators to be used for this section. Show all work to be awarded full marks. When this part is handed in, Part 2 will be provided.

1. Determine the exact value of  $\cos\left(\frac{4\pi}{3}\right)$ . (3 marks)
2. Determine an exact value for  $\sin\frac{5\pi}{4} - \cos\frac{11\pi}{6}\cot\frac{\pi}{3}$ . (3 marks)
3. Determine two equivalent expressions for  $\tan\left(-\frac{\pi}{3}\right)$ . (2 marks)