

MATH 119: Midterm 2

Name: _____

Directions:

- * Show your thought process (commonly said as "show your work") when solving each problem for full credit.
- * If you do not know how to solve a problem, try your best and/or explain in English what you would do.
- * Good luck!

Problem	Score	Points
1		10
2		10
3		10
4		10
5		10
6		10
		60

1. Simplify these expressions:

$$\star \sin^2\left(\frac{\pi}{3}\right) + 2\cos\left(\frac{-4\pi}{3}\right) + 3\tan\left(\frac{\pi}{4}\right)$$

$$\star \frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta}$$

2. Short answer questions.

⚠ Justify each answer with formulas or facts for full credit; do not just write "yes" or "no" ⚠.

(a) Given $f(x) = \sin(x)$, does there exist $x \in \mathbb{R}$ such that $f(x) = 2$? Why or why not?

(b) If a mass attached to a spring is moving in simple harmonic motion, can we use the function

$$d(t) = a \tan(\omega t)$$

to model its displacement? Why or why not?

(c) Is it possible for linear speed to be less than angular speed? Why or why not?

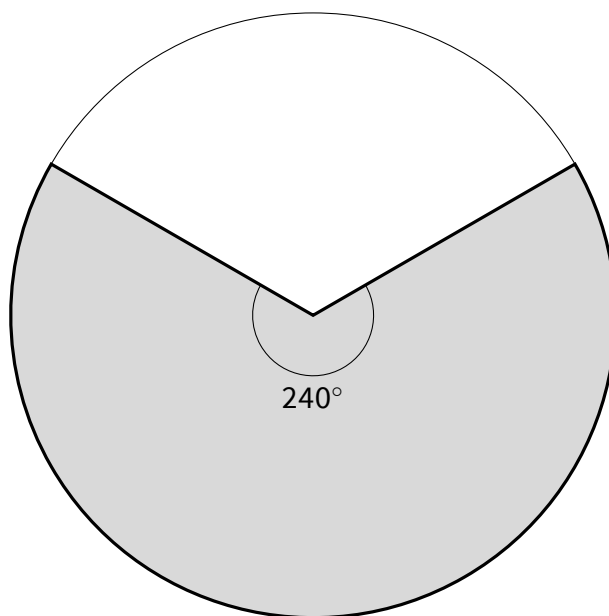
(d) When simplifying trig identities, are we allowed to square both sides? Why or why not?

3. Prove these identities:

$$\star \frac{1}{\sin x} - \sin x = \cot x \cdot \cos x$$

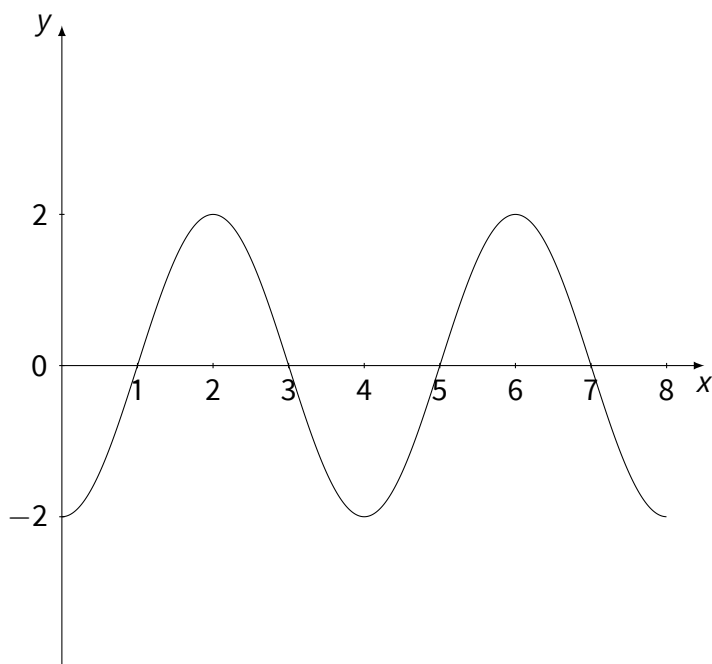
$$\star \cos(\alpha + \beta) \cos(\alpha - \beta) = \cos^2 \alpha - \sin^2 \beta$$

4. Suppose the shaded region is 6π in². Find the radius of the circle; your answer should be an integer.



5. Suppose a triangle has $a = 50$, $b = 50$, $\angle A = 60^\circ$. Solve the triangle.

6. Suppose a mass attached to a spring is moving in simple harmonic motion. The displacement $f(t)$ is shown in the following graph.



Here, t is measured in seconds and $f(t)$ is measured in centimeters.

(a) Find a function $f(t)$ describing the displacement.

(b) How many centimeters is the mass displaced at time $t = \frac{3}{2}$?