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:

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

   * $\dfrac{1}{1+\sin\theta} + \dfrac{1}{1-\sin\theta}$

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 it's displacement? Why or why not?

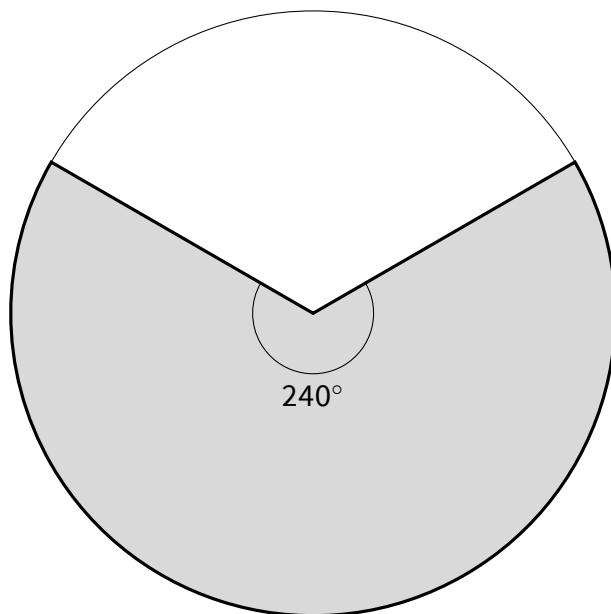(c) Is it possible for linear speed to be less than angular speed? Why or why not?

(d) When proving a trig identity, are we allowed to square both sides? Why or why not?

3. Prove these identities:

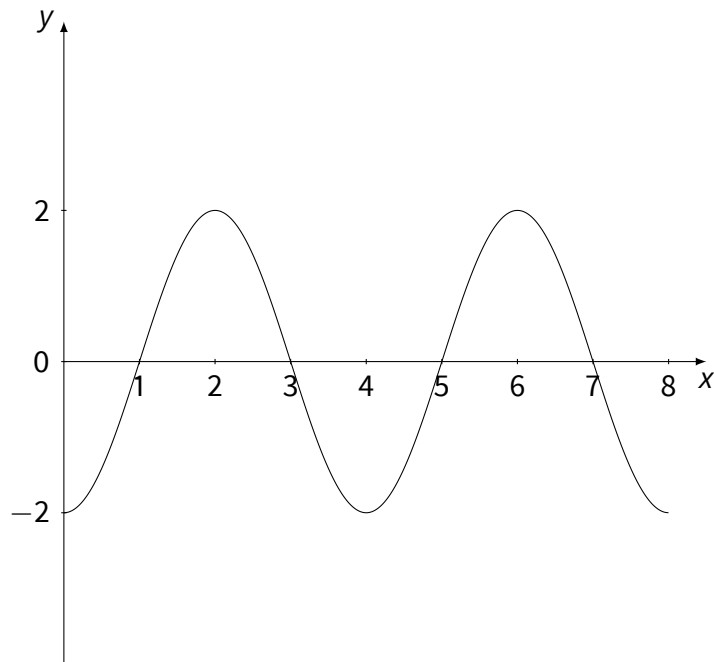$\star \quad \dfrac{1}{\sin x} - \sin x = \cot x \cdot \cos x$

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

4. Suppose the shaded region is 6π in^2. Find the radius of the circle; your answer should be an integer.

240°

5. Suppose a triangle has $a = 50, b = 50, \angle A = 60°$. 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 $t = \dfrac{3}{2}$?