Warm up

1. (a) Using the unit circle, identify the terminal side of the following angles.

\[
\frac{14\pi}{3}, \quad \frac{11\pi}{2}, \quad -\frac{3\pi}{4}
\]

(b) Evaluate

i. \( \sin \left( \frac{14\pi}{3} \right) \)

ii. \( \cos \left( \frac{11\pi}{2} \right) \)

iii. \( \tan \left( -\frac{3\pi}{4} \right) \)

Problems

1. (a) Show that for any angle \( \theta \), the following identity is always true.

\[ \sin^2 \theta + \cos^2 \theta = 1. \]

(b) Let

\[ f(x) = 3\sin^2 x + 2, \quad g(x) = -(\cos^2 x + 5\sin x). \]

Find the point(s) where the graphs of \( f \) and \( g \) intersect. (Consider only the \( x \) coordinates in \([0, 2\pi]\).)

How to get started:

* How to formulate “two functions intersect at some point”?

* How to solve the resulting equation? Can I apply factoring? why/why not?

* Can I first simplify the resulting equation then apply factoring? Think about using part (a) to simplify.
2. Suppose you need to find the height of a tall building. Standing 20 meters from the base of the building, you aim a laser pointer at the closest part of the top of the building. The laser pointer is held 2 meters above the ground. You measure that the laser pointer is 15° tilted from pointing straight up. How tall is the building? (Leave your answer in a calculator-ready form.)

How to get started:
* Read the question carefully and draw a picture of the scenario.

* Assign the given values to your picture and label the unknown value in the picture.

* Based on the picture, what mathematical formula can be used to find the unknown value? Any trig ratio?

Reflection: (Individually) Think about the initial strategies that you usually apply to start solving a math problem and write them down. You may choose from the following list:

- Reading the problem carefully.
- Sketching a diagram or picture if possible.
- Looking for any clue words.
- Using basic known formulas.
- Translating words into mathematical concepts.
- Relating the problem to a topic in the course.