1) A ferris wheel is 40 meters in diameter and can be boarded from a 10 meter platform. The wheel rotates counter-clockwise and completes one full revolution every 4 minutes. Suppose that at \( t = 0 \) you are in the three o’clock position, and that you are ascending. Assume that you get off the ferris wheel after having completed two full revolutions and after having returned to the boarding platform.

a) Sketch a graph of \( h(t) \), your height in meters above the ground \( t \) minutes after the wheel begins to turn.

b) Find a formula to model your height above ground after \( t \) minutes on the ferris wheel.

c) What is your height above the ground after 5 minutes on the ferris wheel?

d) How long after \( t=0 \) must you ride the ferris wheel until you can exit off the platform. (Remember that you are riding for two complete revolutions.)

d) At what time (to the nearest tenth of a minute) will you first reach 45 meters?
2) If \( \sin \alpha = \frac{7}{25} \) and \( \cos \alpha < 0 \) and \( \cos \beta = \frac{-12}{13} \) and \( \sin \beta < 0 \),

a) Find \( \sin(\alpha - \beta) \)  
b) Find \( \sin(2\alpha) \)  
c) Find \( \tan(2\alpha) \)

3) Find all solutions to the following for \( 0 \leq \theta \leq 2\pi \), giving exact values when possible.  
(Only an algebraic solution will be accepted.)

a) \( 2\cos^2 t = \sin t - 1 \)

b) \( 2\cot \theta = \csc^2 \theta - 4 \)

4) Prove the following identity:

a) \( \frac{2\tan \theta - \sin(2\theta)}{2\sin^2 \theta} = \tan \theta \)

**Bonus:** With your calculator in radian mode, explain why

\( \sin^{-1}(\sin(1)) = 1 \), yet \( \sin^{-1}(\sin(5)) \neq 5 \)