

# WORKSHEET 6: 18 points

Math 6B-030, Spring 2021

Due: Friday, May 14th, 11:59pm via Gradescope

**Question 1 (5 points)** A race-car starts at the 6 o'clock position and drives counterclockwise on a circular track with a radius 7 miles.

- (a). (2 points) What distance (in miles) has the race-car traveled if the angle swept out by the race-car is:
  - (i).  $90^\circ$ ?
  - (ii). 5 radians?
- (b). (2 points) What is the angle measure (in radians) swept out if the race-car has traveled 8 miles counterclockwise?
- (c). (1 point) Suppose the car travels at a constant speed of 60 miles per hour. How long does it take the race-car to complete one revolution around the track? **Include units.**

**Question 2 (5 points)** Julie starts a ferris wheel ride at the top (9 o'clock position). The wheel proceeds to rotate counter-clockwise. The ferris wheel is 70 feet wide in diameter and its center is 20 feet above the ground.

- (a). (1 point) What is the angle, in radians, from the 3 o'clock position to where Julie starts?
- (b). (3 points) Write an equation,  $J$  for Julie's height above the ground (in feet) in terms of the measure of the rotation angle,  $\theta$  in radians, since she boarded at 9 o'clock.
- (c). (1 point) Graph  $J$ . Start by plotting Julie's initial position (her height when she starts riding at  $\theta = 0$ ).

**Question 3 (8 points)** The Kentucky Derby is a 5 km race. Assume the track is circular and horses run counterclockwise around the track starting due east of center. Let  $\theta$  be the angle (in radians) the horse has swept out counterclockwise since starting the race.

- (a). (1 point) Draw a picture of the horse's path along the circular track. Place the center of the track at the origin. Label (answers may include  $r$  for radius,  $\theta$  for angle):
  - (i). starting position,
  - (ii). horse's direction of travel (with arrow), and
  - (iii). coordinates of 2 points on the track.
- (b). (2 points) Find the radius of the track. Be precise.
- (c). (1 point) What does  $\theta > 8\pi$  mean about the path of the horse? *Explain in words that a 2nd grader would understand.*
- (d). (1 point) The horse's distance (in km) east of the center of the track,  $d$ , is a function of  $\theta$ . Write an equation for  $d(\theta)$ .
- (e). (2 points) How many kilometers has the horse traveled if the angle swept out by the horse is  $\pi$  radians? 90 degrees? Determine which is longer and explain your answers.
- (f). (1 point) Suppose the horse travels at a constant speed of 35 km per hour. How long does it take the horse to run once around the track? **Justify and include units.** *You may leave fractions in your answer. Do not use a calculator.*