Math 42
Summer 2020
Bambhania

Groupwork 1: Chapter 5

(15 points)

Please discuss these problems in groups. After the discussion, write up your solutions independently. Write up your solutions in a way that demonstrates not only your understanding of the material, but also your ability to express the correct solution in writing in such a way that another person can make sense of it easily. This includes features, such as, clearly defined variables, well drawn and labeled figures, all steps shown in a clear and logical way, final answer clearly identified, etc. In grading this set, I will check some of the problems for correctness, but I will be primarily looking for how well the set is written up.

1. Find an angle $0 \leq \theta \leq 2\pi$ that is coterminal to $\frac{39\pi}{4}$.

2. A wheel on a tractor has a 24-inch diameter. How many revolutions does the wheel make if the tractor travels 4 miles?

3. Consider the following scenario: A child enters a carousel of radius 1 that takes one minute to revolve once around. The child enters at the point $(0, -1)$, which is the lowest point on the Carousel. Assume the carousel revolves counter clockwise.

   a. What are the coordinates of the child after 45 seconds?
   b. What are the coordinates of the child after 1 minute and 20 seconds?
   c. If the ride goes on for 6 minutes, list all the times when the child will pass through position $\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$.

4. The equation $P = 20\sin(2\pi t) + 100$ models the blood pressure of a person with time t in seconds.
   a. Compute the blood pressure of the person 0.25 seconds intervals starting with 0 seconds up to 3 seconds. Put your answers in a table.
   b. What are the maximum and minimum values possible for blood pressure of this person? These number are called *systolic* and *diastolic*, respectively.
   c. What appears to be the period for the blood pressure function? That is, what is the smallest number of seconds after which the function values repeat in the same pattern?
   d. The blood pressure function repeats at each heartbeat, with the maximum value occurring at the moment heart beats, pushing out blood. How fast is this person's heart beating, in beats per minute?

5. If $\sin t = \frac{3}{4}$, and the terminal side of t ends in quadrant II in standard position, Find:

   a. $\cos t$ b. $\csc t$ c. $\tan t$ d. $\sin(-t)$ e. $\cos(-t)$ f. $\sin(\pi - t)$ g. $\cos(\pi - t)$

6. A regular pentagon (5-sided polygon with all equal sides) is inscribed in a circle of radius 20 inches. Estimate the length of the side of the pentagon. Round your answer to two decimal places. Sketch a clearly labeled diagram.

7. A surveyor in a helicopter is trying to determine the width of an island as she approaches the island. The helicopter is 3000 feet above sea level. The surveyor measures the angle of depression to the farther end of the island to be $27°$ and the angles of depression to the nearer end to be $39°$.

   a. Sketch a clearly labeled diagram.
   b. What is the shortest distance the helicopter would have to travel to land on the island?
   c. What is the width of the island?