Math 8
Winter 2020

Preliminary Homework
Assigned Wednesday, February 5

Note: Preliminary homework is always graded credit or no credit. **You get full credit for completing the assignment, whether or not your answers are correct.** The purpose of preliminary homework is to start you thinking about the topic of the next class.

You may use your preliminary homework in activities with your classmates. You should be sure to think about these questions so you will be prepared.

Preliminary homework is always due at the *beginning* of class.

In a previous homework assignment, you showed the following:

> Suppose an object starts at point (a, b, c) and moves with constant velocity $\vec{v} = \langle v_x,\, v_y,\, v_z \rangle$ for t seconds.
>
> Then its final position is $(a + v_x t,\, b + v_y t,\, c + v_z t)$.

We can express this by a function whose domain is the real number line $\mathbb{R}$ and whose range lies in the three-dimensional space $\mathbb{R}^3$,

$$\vec{f}(t) = (a + v_x t,\, b + v_y t,\, c + v_z t),$$

where t represents time, with $t = 0$ being the starting time, and $\vec{f}(t)$ is the object's position vector at time t.

Another object is traveling clockwise around the unit circle $x^2 + y^2 = 1$ in the plane $\mathbb{R}^2$. At time $t = 0$ it is at the point $(1, 0)$, and it travels at constant speed, making one complete trip around the circle in 2π units of time.

1. What is the angle (in radians) between the object's position vector and the positive x-axis (measured counterclockwise from the positive x-axis) when $t = .25$?

   (Hint: If the object makes one complete trip around the circle in 2π units of time, what fraction of the circle has it traveled along between $t = 0$ and $t = .25$?)

2. At what time $t > 0$ is the angle between the object's position vector and the positive x-axis first equal to $\dfrac{4\pi}{3}$?

3. What is the angle $\theta(t)$ between the object's position vector and the positive x-axis at time t?

4. What is the object's position vector $\vec{f}(t)$ at time t?