# Worksheet 7

## MATH 006B - Schmidt

Winter 2021

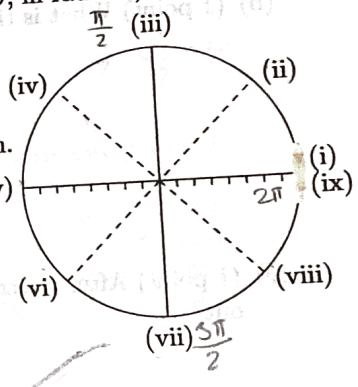
**Instructions:**

- **Show ALL your work to receive credit!** Cross off anything you do not wish to be graded.
- Simplify your answers as much as possible. For instance, evaluate $2^2$, but not $\sqrt{2}$.
- **Work with your group** on the following exercises. Each of you will turn in your own work via Gradescope.
- **Your group** may ask the TA questions, which the TA will answer with leading questions (not answers) to help guide you to the answer.

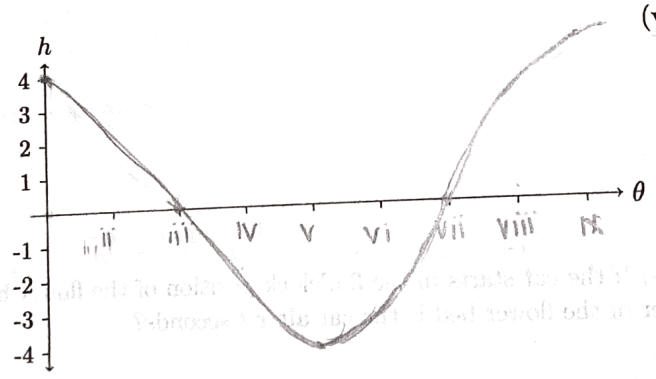
1. (6 points) A puppy is chained to a post in a yard and enjoys running in a counter-clockwise direction. The chain is 4 meters long and spins freely on the post. Let $h$ be the puppy's horizontal distance (in meters) to the right of the post. This distance varies with the angle ($\theta$, in radians) swept out by the puppy as it runs counter-clockwise.

   (a) (3 points) On the graph below, plot the points corresponding to the moments when the puppy is at positions (i)-(ix), depicted on the circle to the right, where (ix) is one full rotation. On your graph:
   - label the $\theta$-axis with all 9 angle measures **in radians**.
   - estimate the puppy's horizontal position for all 9 angles.

   Then draw a curve that smoothly connects the 9 points.




Sin → vertical
Cos → horizontal




   (b) (2 points) Write a formula for $h$ in terms of $\theta$.

   $h(\theta) = \cos(\theta)$

   (c) (1 point) If the angles were in degrees instead of radians, how would your graph change?

   The graphs would simply change from $2\pi$ to $360°$.

2. (8 points) A cat runs at a speed of 10 feet per second counter-clockwise around a circular flower bed with a radius of 8 feet.

(a) (3 points) How long does it take the cat to run one full lap around the flower bed? Show your work and include units. Leave your answer in exact form.

speed: 10 ft/second

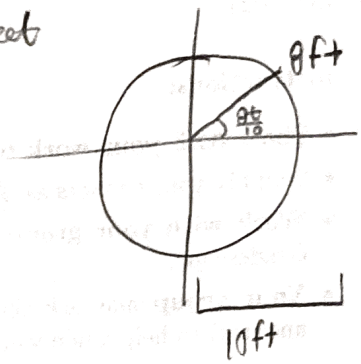
radius: 8

circumference: 16

$8 \cdot 2\pi = 16\pi$ feet

$16\pi$

$\frac{16\pi}{10 \text{ ft/sec}} \rightarrow$ 5.0265 seconds




(b) (1 point) What is the cat's angular speed (in radians per second)?

$\frac{8t}{10} \div 2 \rightarrow \frac{4t}{5}$

$w = \frac{\theta}{t}$

$\frac{10}{8}$ ft per second

(c) (1 point) After $t$ seconds, what is the measure (in radians) of the angle that the cat has swept out?

1.25t radius

$\frac{10 \text{ ft}}{8 \text{ ft}} = 1.25 \text{ ft}$

(d) (3 points) If the cat starts in the 3 o'clock position of the flower bed, how far "above" (in feet) the center of the flower bed is the cat after $t$ seconds?

8t ~~$\theta = 8t$ sec~~

$\hookrightarrow 8 \sin(\frac{4t}{5})$ ft

3. (1 point) Participation – no submission