6. [13 points] The alternative rock band \( \pi \)'d-Eye-Blind was unhappy with the first music video and are trying again. There is just one camera on a drone, which again moves in a circle at a constant speed, between a maximum of 12 feet above the ground and a minimum of 2 feet above the ground. At time \( t = 0 \) it is halfway between the maximum and minimum height, and moving upward. It makes one full circle in 8 seconds.

Let \( D(t) \) be the height of the drone \( t \) seconds after they start filming.

a. [4 points] Sketch a graph of \( y = D(t) \) for \( 0 \leq t \leq 10 \). Be sure to label your axes, and pay careful attention to the shape of your graph.

![Graph of \( y = D(t) \)](graph)

b. [4 points] Find a formula for \( D(t) \).

Answer: \[ D(t) = 5 \sin \left( \frac{\pi}{8} t \right) + 7 \]

c. [5 points] Find all times at which the drone is exactly 5 feet above the ground for \( 0 \leq t \leq 10 \). Show your work, and give your answers in exact form.

Note: based on graph, there should be \( \frac{2}{3} \) such times.

\[ 5 \sin \left( \frac{\pi}{4} t \right) + 7 = 5 \]

\[ 5 \sin \left( \frac{\pi}{4} t \right) = -2 \]

\[ \sin \left( \frac{\pi}{4} t \right) = \frac{-2}{5} \]

One time:

\[ \frac{\pi}{4} t = \arcsin \left( \frac{-2}{5} \right) \]

\[ t = \frac{1}{4} \arcsin \left( \frac{-2}{5} \right) \]

but this is \( < 0 \).

\begin{align*}
\text{and} \quad & t = 8 + \frac{1}{4} \arcsin \left( \frac{-2}{5} \right) \\
& \text{and} \quad 4 - \frac{4}{\pi} \arcsin \left( \frac{-2}{5} \right).
\end{align*}