Week 2 Group Problem: Interference

Two radio antennas A and B are separated by 300 m as shown in the figure. They simultaneously broadcast identical signals at a single wavelength. A radio in a car at the position shown receives the signals.

a) How do the distances from the car to each of the antennas compare?

\[ d_A = d_B \quad d_A > d_B \]

b) What is the condition on the difference of the path lengths that would cause complete destructive interference at the car?

\[ d_A - d_B = \frac{\lambda}{2}, \quad 5\frac{\lambda}{2}, \quad etc \]

c) Calculate the exact distances \( d_A \) and \( d_B \). Do not use any approximations.

\[ d_A = \sqrt{1000^2 + 550^2} = 1141.27 \]
\[ d_B = \sqrt{1000^2 + 250^2} = 1030.78 \]

d) Calculate the longest wavelength that would cause complete destructive interference at the car.

*Path length difference could be \( \lambda/2, \) or \( 3\lambda/2, \) etc. For \( \lambda/2 = 1141.27 - 1030.78 = 110.49 \text{ m} \). So \( \lambda = 221 \text{ m} \).*