

Math 1613 - Trigonometry

Written Assignment 6 - Due 2019.07.14

Directions: Please answer the following question in complete sentences. Be sure to label all geometric objects in any illustrations (if any). I will accept an answer in a scanned image format, as a pdf, or as a picture taken and sent from your awesome smart phone.

Question: An airplane flying faster than sound sends out sound waves that form a cone. The cone intersects the ground to form a hyperbola. As this hyperbola passes over a particular point on the ground, a sonic boom is heard at that point. If θ is the angle at the vertex of the cone, then

$$\sin\left(\frac{\theta}{2}\right) = \frac{1}{m},$$

where $m > 1$ is the Mach number for the speed of the plane. The Mach number is the ratio of the speed of the plane to the speed of sound. Thus, a speed of Mach 1.4 means that the plane is flying 1.4 times the speed of sound.

- (a) If $m = \frac{5}{4}$, find the angle θ .
- (b) If $\theta = \frac{\pi}{3}$, find m .
- (c) If $m = 12.1$, find the angle θ in degrees.