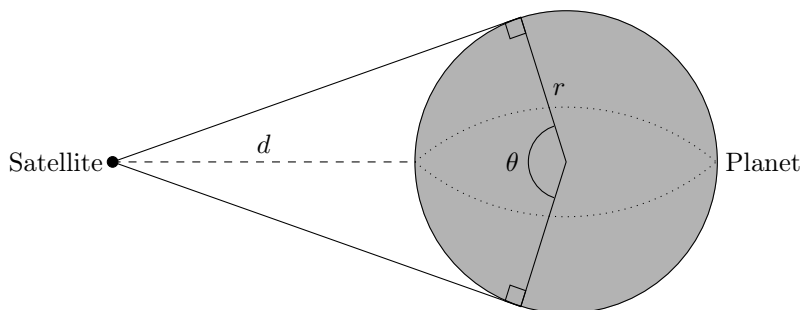


**Math 105: Trigonometry**  
**Worksheet 3, Due Thursday June 27th at noon**

1. A satellite circles a planet  $d$  miles from the planet's surface. The satellite observes horizons on the planet's surface as shown below, where  $r$  is the radius of the planet in miles.



(a) Express  $d$  in terms of  $r$  and  $\theta$ .

(b) Express  $r$  in terms of  $d$  and  $\theta$ .

(c) Express  $\theta$  in terms of  $r$  and  $d$ .

(d) Calculate  $\theta$  if  $r = 5200$  and  $d = 380$ . Give your answer in both degrees and radians, accurate to three decimal places.

**2. Identities.**

(a) Prove that  $\frac{\csc(x) - \cot(x)}{\sec(x) - 1} = \cot(x)$  is an identity.

(b) Determine in which quadrants  $\frac{\sec(t) - 1}{\tan(t)} = \sqrt{\frac{1 - \cos(t)}{1 + \cos(t)}}$  is an identity. Then prove the identity for the quadrants determined.