Unit 5: Trigonometry & The Unit Circle
5.3 The Tangent Function

*web applets: http://www.univie.ac.at/future.media/moe/galerie/fun2/fun2.html
                     http://www.ronblond.com/MathGlossary/Division04/TrigCircle/
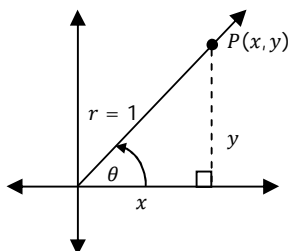
$\tan \theta = \dfrac{y}{x}$

we also know from 4.2 that on the unit circle $P(x,y) = (\cos\theta, \sin\theta)$

Thus, $\tan \theta = \dfrac{\sin\theta}{\cos\theta}$

When $\underline{\sin \theta = 0}$, what is $\tan \theta$? $\tan\theta = 0$

When $\underline{\cos \theta = 0}$, what is $\tan \theta$? $\tan\theta$ undefined

$y = \tan \theta$
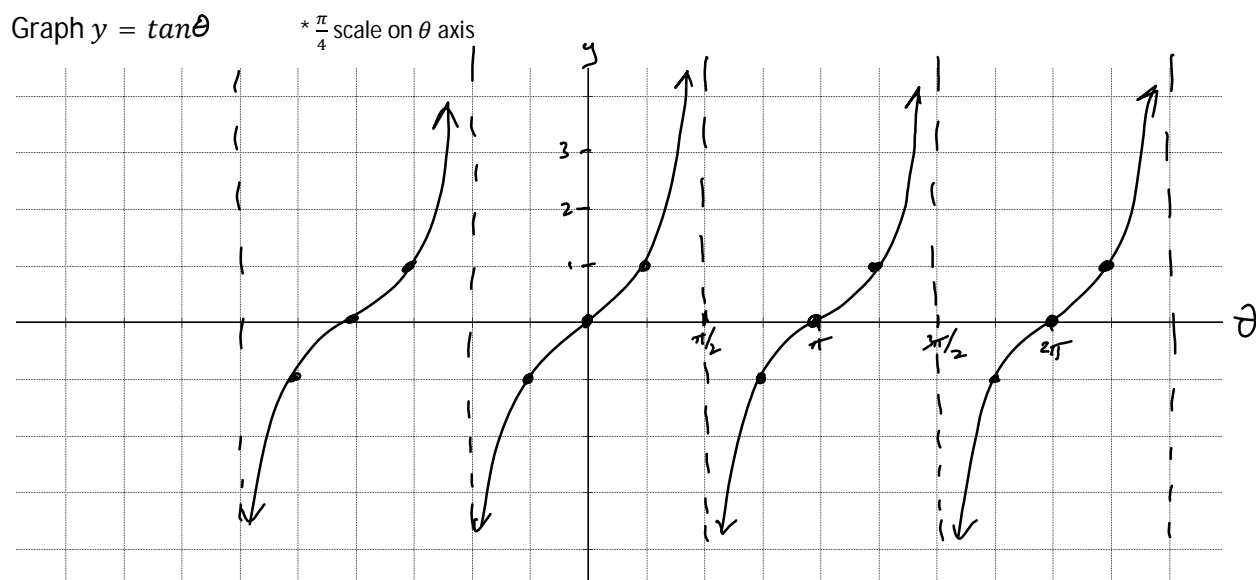* include $\dfrac{\pi}{4}$ reference angles in our table.

∞ = undefined

θ	0	$\pi/4$	$\pi/2$	$3\pi/4$	π	$5\pi/4$	$3\pi/2$	$7\pi/4$	2π
$\tan \theta$	0	1	∞	-1	0	1	∞	-1	0

At undefined values there are _asymptotes_:
boundary lines that the graph approaches but will never touch/cross. (we dash these asymptotes)

Graph $y = \tan\theta$ * $\dfrac{\pi}{4}$ scale on θ axis

period: π

amplitude? none (no max/min)

θ-intercepts: $\theta = \pi n$, $n \in I$
                      same as $\sin\theta = 0$

asymptotes: $\theta = \dfrac{\pi}{2} + \pi n$, $n \in I$
             same as $\cos\theta = 0$

Domain: $\{\theta \mid \theta \neq \dfrac{\pi}{2} + \pi n, \ \theta \in \mathbb{R}, n \in I\}$

Range: $\{y \mid y \in \mathbb{R}\}$

Ex. A small plane is flying at a constant altitude of 6000m directly toward an observer. Assume that the ground is flat in the region close to the observer.

a) Determine the relation between the horizontal distance in meters, from the observer to the plane and the angle, in degrees, formed from the vertical plane.

$$\tan\theta = \frac{d}{6000}$$

$$\boxed{d = 6000\tan\theta}$$
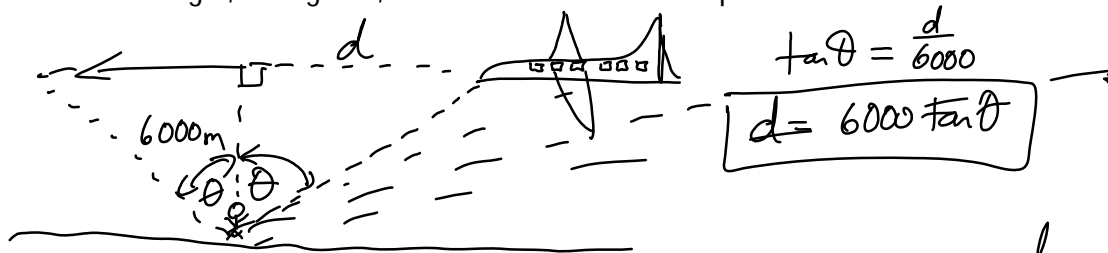
b) Sketch the graph of the function.

c) Where are the asymptotes located in the graph? What do they represent?

$90° ~ \xi ~ -90°$
Plane on ground (on either side)
but not possible
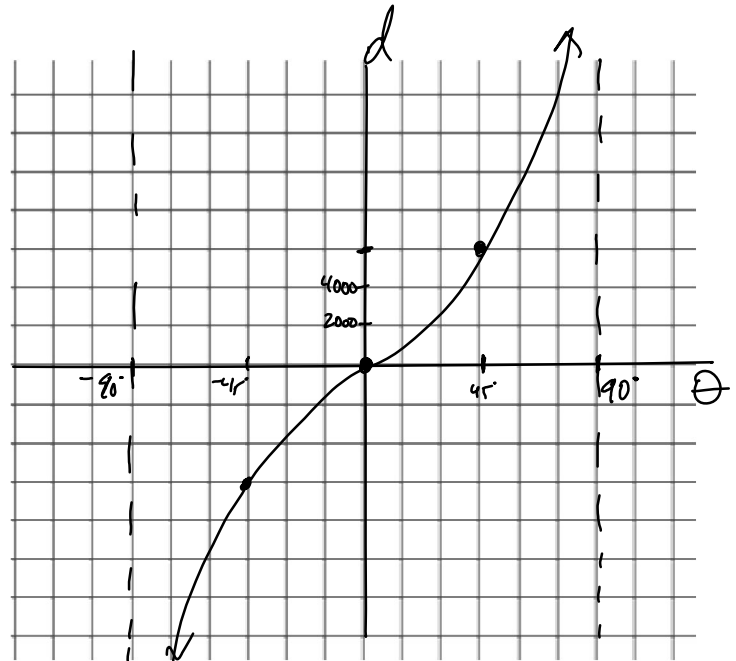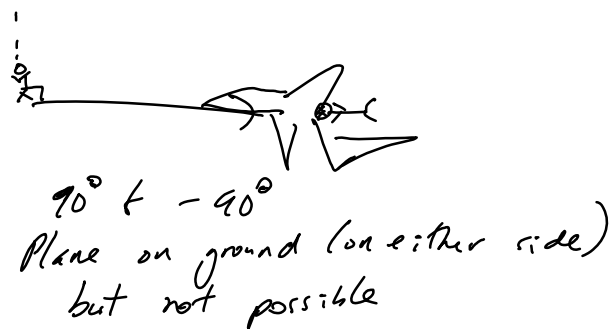
d) Explain what happens when the angle is equal to 0°.

plane right above

$$d = 0 \ m$$

Practice: pg. 262/# 1 – 4, 6, 8, 10, 12, 14, C1, C2