

Goal: Define and use the inverse sine function.

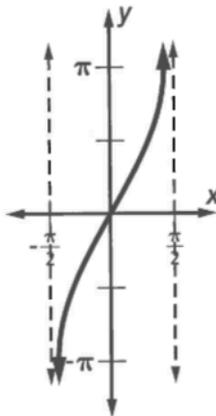
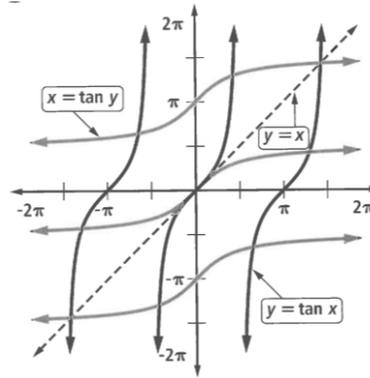


Questions

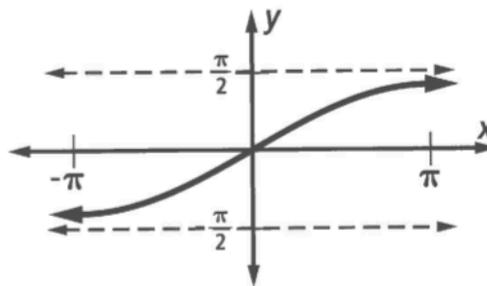
Warm Up: A 20-foot board is leaning against a 6-foot fence, creating a ramp. Find the measure of the angle the board makes with the ground. Then find the measure of the angle the board makes with the fence. Use trigonometric ratios for both of these.

Inverse of Tangent Function

When we found the inverse of cosine and sine, we limited the domain of each inverse. The same must be done for the inverse of tangent.



restricted tangent function
 domain: $\{x \mid -\frac{\pi}{2} < x < \frac{\pi}{2}\}$
 range: \mathbb{R}



inverse tangent function
 domain: \mathbb{R}
 range: $\{y \mid -\frac{\pi}{2} < y < \frac{\pi}{2}\}$

Questions

Definition of Inverse of Tangent Function:

$$y = \tan^{-1} x \text{ if and only if } x = \tan y \text{ and } -\frac{\pi}{2} \leq y \leq \frac{\pi}{2} .$$

The notation _____ is sometimes used instead of \tan^{-1} .

Example 1: Find the approximate values of each in radians and degrees.

a. $\tan^{-1} \sqrt{3}$

b. $\tan^{-1} 88$

Example 2: A plane is flying at an altitude of 32,000 feet (about 6 miles) and wants to descend to an airport runway x miles away at a constant angle θ .

a. Write an equation for θ as a function of x .

b. is $x = 30$, find θ to the nearest degree.

Example 3: Edie is watching a skyscraper being built from her apartment 0.75 miles away. Her 3rd floor window is 28 feet from the ground.

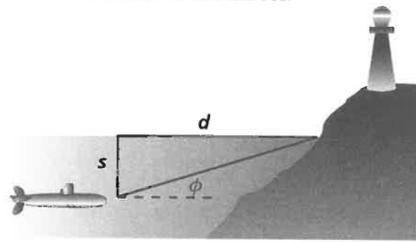
a. As the skyscraper reaches a height of h feet, what is the angle θ of elevation to the top of the skyscraper, in terms of h ?

b. What is the angle of elevation from her window when the skyscraper reaches a height of 400 feet?

Summary:

Questions

Example 3: A submarine is d yards from the entrance of a harbor and submerged s feet. The captain wants to maintain a constant angle of ascent that will allow the submarine to surface at the entrance to the harbor.



- Use the inverse tangent function to write a formula for the angle of ascent θ , in terms of s and d .
- Suppose the submarine's deck is submerged 385 feet at a distance of 20,000 yards from the harbor. What angle of ascent will allow the submarine to surface at the entrance to the harbor?
- There is a reef 1,000 yards from the harbor entrance that rises to within 60 feet of the surface. The submarine's keel is 30 feet from below its deck. What angle of ascent is needed for the submarine to clear the reef?
- If the submarine maintains the angle of ascent in Part b will it clear the reef in Part c?