

1. Let

$$g(x) = \tan x^2.$$

Find $g'(x)$.

2. Let

$$f(x) = \sin^5 3x.$$

Find $f'(x)$.

3. A contestant on Survivor lies on the ground and watches a coconut fall straight down from a tree located 30 feet away. When his line of sight to the coconut makes a 30 degree angle with horizontal and the angle of his line of sight decreases at a rate of 6 degrees per second, how quickly is the coconut falling?

4. A plane is travelling at a constant altitude of 10,000 meters approaches an observer on the ground. When the angle of elevation of the observer's line of sight to the plane (i.e. the angle between the observer's line of sight and the ground) is equal to $\pi/4$ radians and is increasing at a rate of $1/100$ radians per second, what is the velocity of the plane?