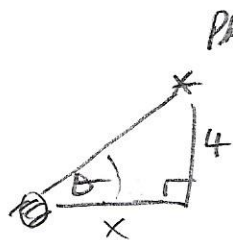


ANGLE OF Elevation \Rightarrow ground up

4. A plane at an altitude of 4 km passes directly over a tracking telescope on the ground. When the angle of elevation is 60 degrees, it is observed the the angle is decreasing at a rate of 30 deg/min. How fast is the palne traveling?



PLANE

$$\frac{d\theta}{dt} = -\frac{\pi}{6}$$

$$\frac{dx}{dt} \Big|_{\theta = \frac{\pi}{3}}$$

$$\tan \theta = \frac{4}{x}$$

$$1 + \tan^2\left(\frac{\pi}{3}\right) = \sec^2\frac{\pi}{3}$$

$$1 + (\sqrt{3})^2 = 4$$

$$\sec^2 \theta \frac{d\theta}{dt} = -\frac{4}{x^2} \frac{dx}{dt}$$

$$\tan \frac{\pi}{3} = \frac{4}{x}$$

$$4\left(-\frac{\pi}{6}\right) = -\frac{4}{4/\sqrt{3}} \frac{dx}{dt}$$

$$\sqrt{3} = \frac{4}{x}$$

$$-\frac{2\pi}{3} = \left(-\frac{4}{1}\right)\left(\frac{\sqrt{3}}{4}\right) \frac{dx}{dt}$$

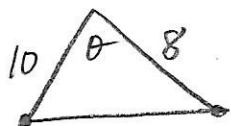
$$x = 4/\sqrt{3}$$

$$\boxed{\frac{+2\pi}{3\sqrt{3}} = \frac{dx}{dt}}$$

5. Two sides of a triangle are 6 and 9. The angle between them is increasing at a rate of 3 deg/min. How fast is the length of the third side increasing when the angle between the other sides is 30 degrees?

$$\frac{dA}{dt} = \sqrt{117 - 54\sqrt{3}}$$

6. Two sides of a triangle are 8 and 10. The angle between them is decreasing at a rate of 5 deg/min. How fast is the area decreasing when the angle between the angle is 45 degrees?



$$A = \frac{1}{2}(8)(10) \sin \theta$$

$$A = 40 \sin \theta$$

$$\frac{dA}{dt} = 40 \cos \theta \frac{d\theta}{dt}$$

$$= 40 \left(\cos \frac{\pi}{4}\right) \left(\frac{\pi}{36}\right)$$

$$= 40 \left(\frac{\sqrt{2}}{2}\right) \left(\frac{\pi}{36}\right)$$

$$= \frac{-5\sqrt{2}\pi}{9} \text{ Rad/MIN}$$

$$\frac{d\theta}{dt} = -\frac{\pi}{36}$$

$$\frac{dA}{dt} \Big|_{\theta = \pi/4}$$