CALCULUS

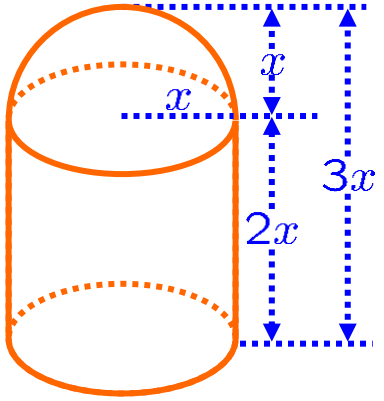
Related rates

NEW

0520-1. NEW A right triangle is growing. At time t, its legs have lengths $3x$ and $6x$, and its area is A, so x and A are expressions of t. Find a formula for dA/dt in terms of x and dx/dt.

0520-2. NEW A regular decagon is growing. At time t, its area is A and its side length is s, so A and s are expressions of t. Find a formula for dA/dt in terms of s and ds/dt.

0520-3. NEW A **silo** is a cylinder capped with a hemisphere. A certain silo is growing. At time t, it has base radius x, height $3x$ and enclosed volume V, so x and V are expressions of t. (The height of its hemisphere is x, and the height of its cylinder is $2x$.) Find a formula for dV/dt in terms of x and dx/dt.

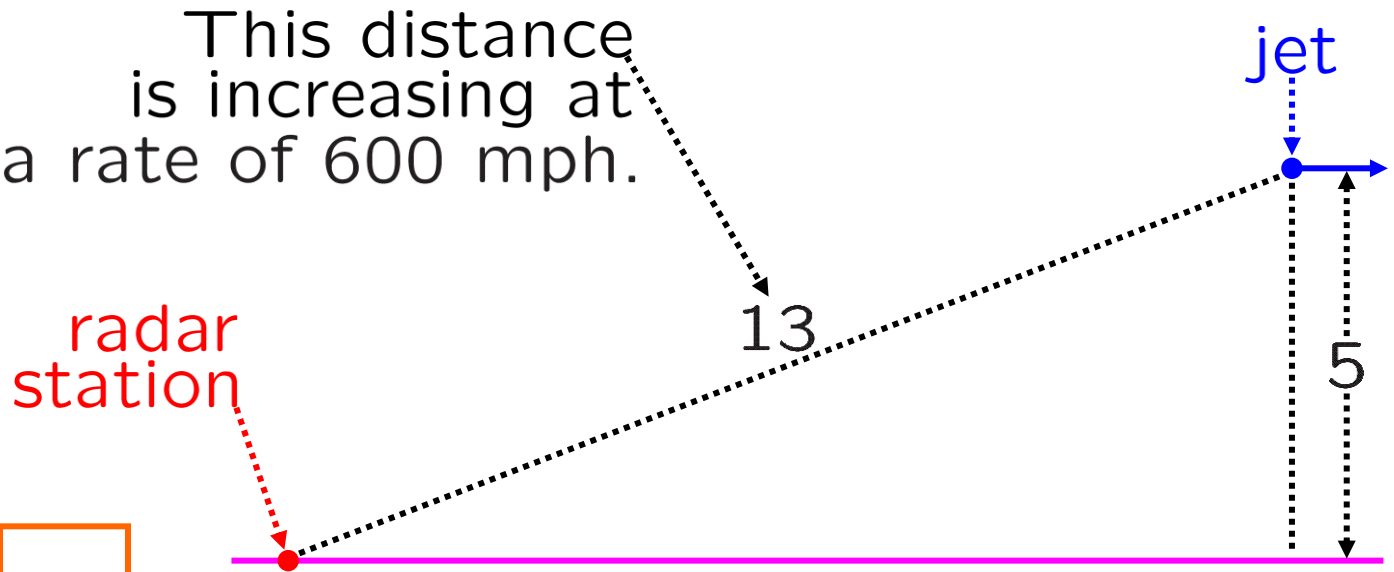


0520-4. NEW Suppose $4x^2 + y + 27 = z^4 + 6z^3$ and $dx/dt = 6$ and $dy/dt = 8$. Compute dz/dt at a certain moment when

$$x = 4,\ y = 3 \text{ and } z = 2.$$

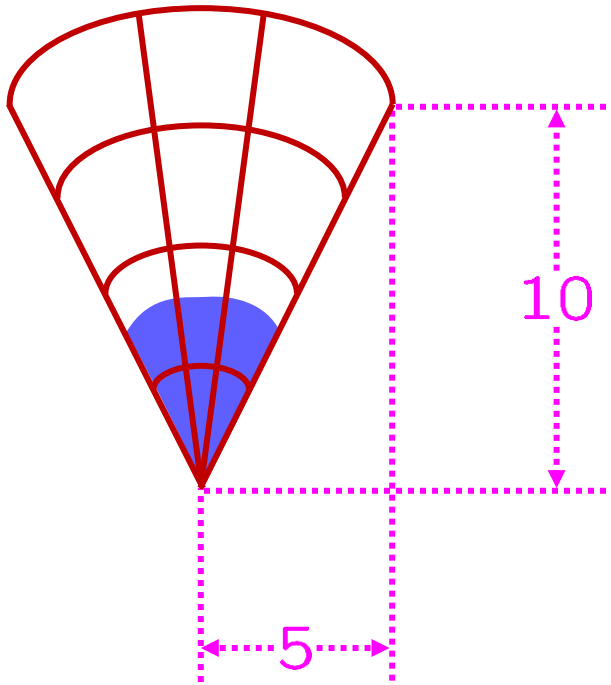
0520-5. NEW A streetlight is at the top of a 26 foot pole. A 6 foot tall man walks directly away from the light at a speed of 2 feet per second. How fast is his shadow growing?

0520-6. NEW A jet flies in a straight line, with constant speed and altitude. It flies directly over a radar station, and, a few minutes later, the radar's instruments show that the plane is 13 miles away, and that its distance from the radar station is increasing at 600 mph. Assuming that the altitude of the jet is 5 miles greater than that of the station, find the speed of the jet.



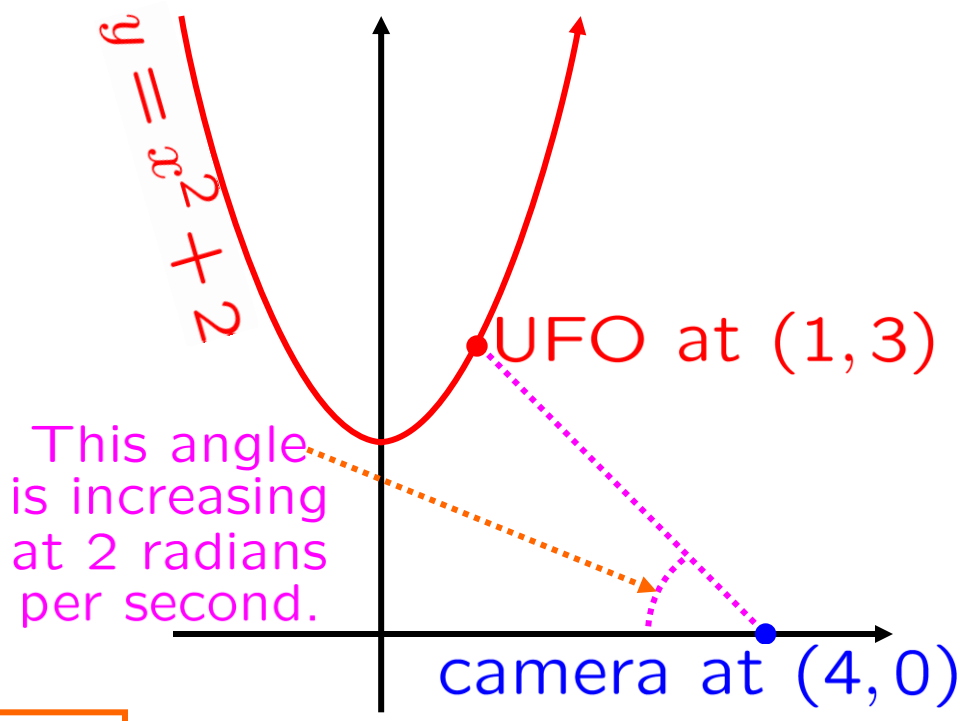
NEW

0520-7. Water is being drained, at a rate of 6 cubic meters per minute, from a conical container of height 10 meters, whose top is is a circle whose radius is 5 meters. When the water level is 4 meters, how fast is that level decreasing?



NEW

0520-8. A camera at $(4, 0)$ is following a UFO that strafes in from above, following the curve $y = x^2 + 2$ from left to right. At the moment when the UFO is at the point $(1, 3)$, retreating back into outer space, the angle between the camera and the horizontal is increasing at 2 radians per second.



a. What is the rate of change in the x-coordinate of the the UFO at that moment?

b. What is the rate of change in the y-coordinate of the the UFO at that moment?

NEW

0520-9. Sand is being poured, at a rate of 4 cubic meters per minute, into a conical pile that is always 5/8 as high as it is wide. How fast is the width of the pile increasing when the pile 16 meters wide and 10 meters high?