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**0520-1.** An equilateral triangle 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  $ds/dt$ .

**0520-2.** A regular hexagon 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.** A regular tetrahedron is growing. At time  $t$ , its volume is  $V$  and its edge length is  $s$ , so  $V$  and  $s$  are expressions of  $t$ . Find a formula for  $dV/dt$  in terms of  $s$  and  $ds/dt$ .

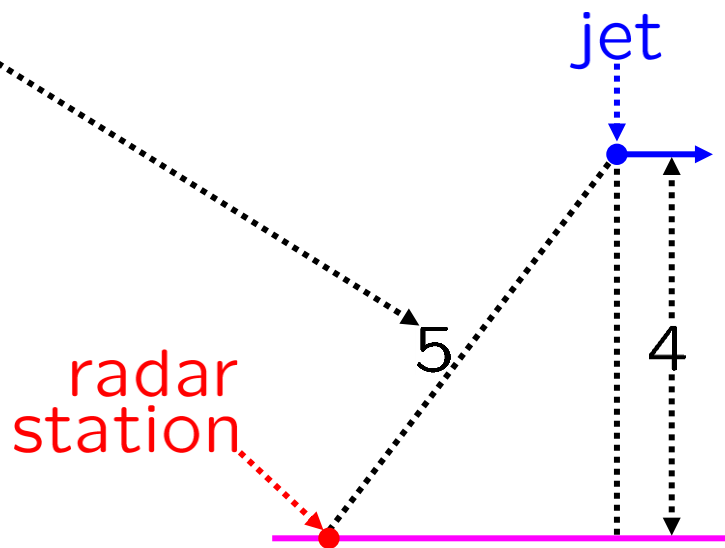
( Hint:  $V = (\sqrt{2}/12)s^3$ . )

0520-4. Suppose  $x^4 + y^4 + 91 = z^3 + z^4$  and  $dx/dt = 6$  and  $dy/dt = 8$ . Compute  $dz/dt$  at a certain moment when  $x = 1$ ,  $y = 2$  and  $z = 3$ .

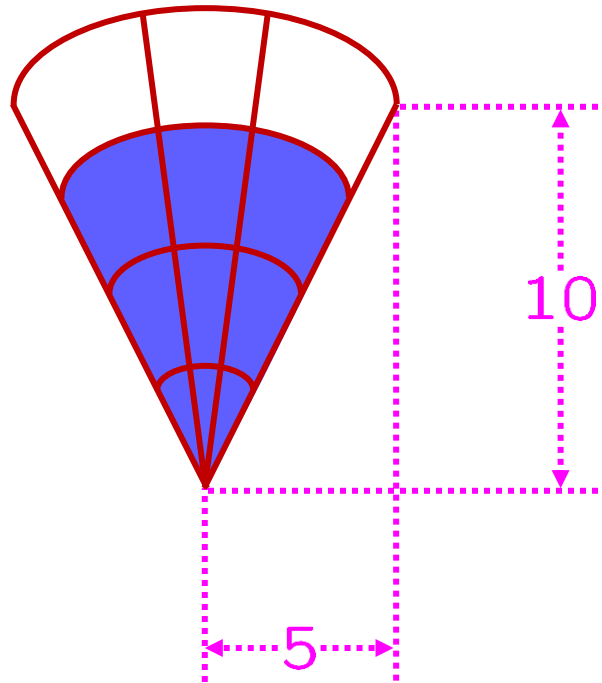
0520-5. A streetlight is at the top of a 20 foot pole. A 6 foot tall man walks directly away from the light at a speed of 3 feet per second. How fast is his shadow growing?

0520-6. 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 5 miles away, and that its distance from the radar station is increasing at 375 mph. Assuming that the altitude of the jet is 4 miles greater than that of the station, find the speed of the jet.

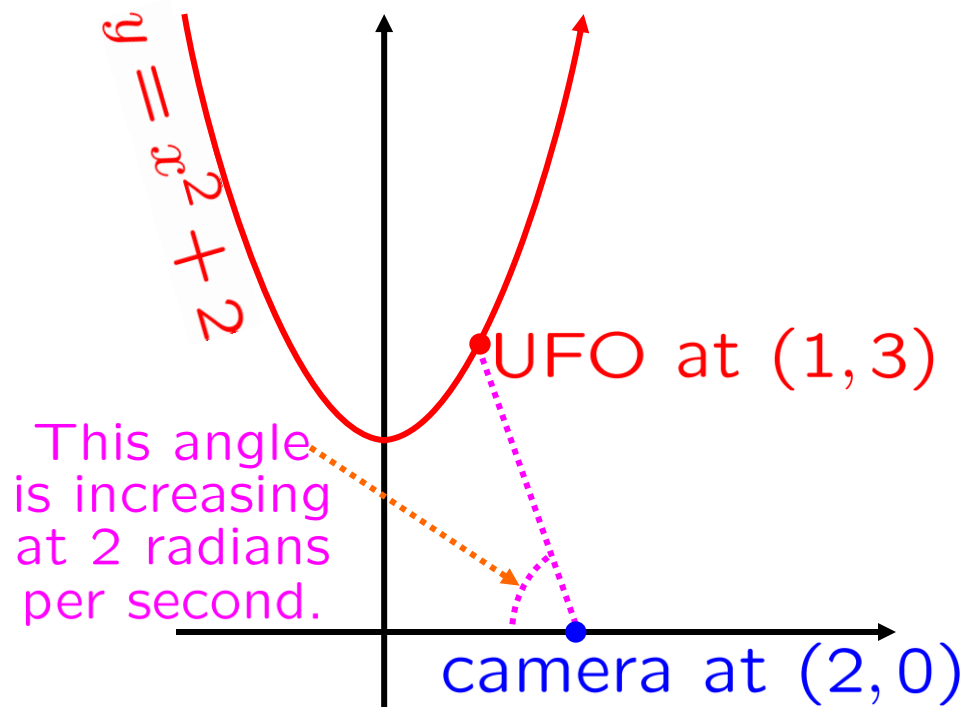
This distance is increasing at a rate of 375 mph.



0520-7. Water is being drained, at a rate of 4 cubic meters per minute, from a conical container of height 10 meters, whose top is a circle whose radius is 5 meters. When the water level is 7.5 meters, how fast is that level decreasing?



0520-8. A camera at  $(2, 0)$  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.



- What is the rate of change in the  $x$ -coordinate of the the UFO at that moment?
- What is the rate of change in the  $y$ -coordinate of the the UFO at that moment?

0520-9. Sand is being poured, at a rate of 7 cubic meters per minute, into a conical pile that is always twice as wide as it is high. How fast is the height of the pile increasing when the pile 10 meters wide and 5 meters high?

