

#28 Related Rates 4.6

SHOW ALL WORK FOR EACH OF THESE PROBLEMS. GIVE UNITS IN SIMPLEST FORM.

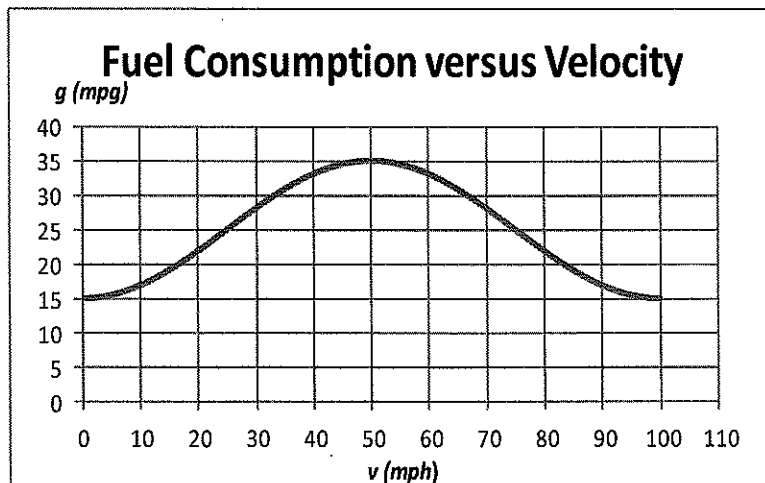
1. Consider (meditate on or reflect upon) a nice red spherical balloon that is in the process of being blown up (as in *expanded*). Of-course, as the volume increases, then so does the radius; each of these are functions of time.
 - (a) When the radius of a balloon is 10 cm, how is the volume of the balloon changing with respect to the change in its radius?
 - (b) If the radius of the balloon is increasing at 0.5 cm/sec, then at what rate is air being blown into the balloon at the instance that the radius is 6 cm?
 - (c) When the volume of the balloon is 50 cu. cm., how is the radius of the balloon changing with respect to volume?

2. The volume of a tree is given by $V = \frac{1}{12\pi} C^2 h$. C is the circumference of the tree in meters at ground level and h is the height of the tree in meters. Both C and h are functions of time t in years.
 - (a) Find a formula for $\frac{dV}{dt}$. What does it represent?
 - (b) Suppose the circumference grows at a rate of 0.2 meters/year and the height grows at a rate of 4 meters/year. How fast is the volume of the tree growing when the circumference is 5 meters and the height is 22 meters.

3. An airplane, flying at 450 km/hr at a constant altitude of 5 km, is approaching a camera mounted on the ground. Let A be the angle of elevation above the ground at which the camera is pointed. When $A = \pi/3$, how fast does the camera have to rotate in order to keep the plane in view?

ROUND ANSWER TO 1 DECIMAL PLACE.

4. The figure below shows the fuel consumption, g , in miles per gallon, of a car traveling at v mph. At one moment, the car was going 70 mph and its deceleration was 8000 mph per hour. How fast was the fuel consumption changing at that moment? Give answer to the nearest hundred.



5. A spherical snowball melts in such a way that the instant at which its radius is 20 cm, its radius is decreasing at 3 cm/sec. At what rate is the volume of the ball of snow changing at that instant?
GIVE EXACT ANSWER.

6. A 3 meter ladder stands against a high wall. The foot of the ladder moves outward at a speed of 0.1 m/sec when the foot is 1 meter from the wall.

(a)(i) At that moment, how fast is the top of the ladder falling?

(ii) If the foot of the ladder had been 2 meters from the wall and the speed at which it moves outward remains at 0.1 m/sec, how fast is the top of the ladder falling?
ROUND ANSWER TO 3 DECIMAL PLACES.

(b) If the foot of the ladder moves out at a constant speed, how does the speed at which the top falls change as the foot gets farther out?