Related Rates of Change

1. The radius of a circle is increasing at a rate of 5 cm/s. Find the rate of change of the area, when the radius is 6 cm.
2. The area of a circle is increasing at a rates of 56π cm^2/s. Find the rate of increase of the radius, when the radius is 7 cm.
3. The side of a square, with side length x, is increasing at a rate of 10 cm/s. Find the rate of change of the area, when the side length is 3 cm.
4. The area of a square, with side length x, is increasing at a rate of 100 cm^2/s. Find the rate of increase of the side, when the area is 25 cm^2
5. The radius of a sphere is increasing at a rate of 6 cm/s.
   i. Find the rate of increase of the volume, when the radius is 4 cm.
   ii. Find the rate of increase of the surface area, when the radius is 5 cm.
6. The volume of a sphere is increasing at a rate of 48π cm^3/s.
   i. Find the rate of change of the radius in terms of r.
   ii. Find the rate of change of the radius when r=3 cm.
   iii. Find the rate of change of the surface area, when r=4 cm.
7. A cylinder is such that its height is the same as its diameter.
   i. Write down the formula for the volume of this cylinder, in terms of r.
   ii. The radius of this cylinder is increasing at a rate of 1 m/s. Find the rate of increase of the volume of the cylinder, when the radius is 50 cm.
8. A stone is dropped into a liquid, creating a circular ripple, with a radius expanding at a rate of 2 cm/s. Find the rate of increase of the area of this circular ripple, after 5 seconds.
9. A cone has a height that is five times the length of the radius.
   (a) Write an expression for the volume in terms of h.
   (b) A cone has radius 1 cm and height 5 cm. Water is being poured into this cone at a rate of 3 cm^3/s.
      i. Find the rate at which the water is rising ($\frac{dh}{dt}$), when the cone is half full.
      ii. Find the rate at which the area of the free surface (circle) is increasing, when the cone is a quarter full.

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