

## Related Rates WS

1. A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius  $r$  of the outer ripple is increasing at a constant rate of 1 foot per second. When the radius is 4 feet, at what rate is the total area  $A$  of the disturbed water changing?
2. A man starts walking north at 4 ft/s from a point P. Five minutes later a woman starts walking south at 5 ft/s from a point 8000 ft due East of P. At what rate are the people moving apart 15 min after the woman starts walking?
3. A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 20 m higher than the bow of the boat. If the rope is pulled in at a rate of 1 m/s, how fast is the boat approaching the dock when it is 8 m from the dock?
4. A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s. At what rate is the angle between the string and the horizontal decreasing when 200 ft of string have been let out?
5. A plane flying with a constant speed of 300 km/h passes over a ground radar station at an altitude of 1 km and climbs at an angle of 30 degrees. At what rate is the distance from the plane to the radar station increasing a minute later?
6. Water is leaking out of an inverted conical tank at a rate of  $10,000 \text{ cm}^3/\text{min}$  at the same time the water is being pumped in to the tank at a constant rate. The tank has height 6 m and the diameter at the top is 4 m. If the water level is rising at a rate of 20 cm/min when the height of the water is 2 m, find the rate at which the water is being pumped into the tank.