Related Rates

1. A particle moves along the curve $xy + x = y + 5$.
When the particle is at the point $(2, 3)$, its x position is changing at rate $\frac{dx}{dt} = 4$.
At this point, what is the rate of change of the y position?

2. A 10 ft ladder slides down the side of a building.
When the base of the ladder is 6 ft from the wall, it is sliding sideways at a rate of 3 ft/sec.
At this time, how fast is the top of the ladder sliding?

3. I slide down the side of a building at a rate of 1 m/sec.
Meanwhile my friend runs towards the building at a rate of 2 m/sec.
How fast is the distance between us decreasing when I am 5 m from the ground and my friend is 12 m from the building?

4. The area of a round puddle increases at a rate of 5 ft^2/min.
At what rate is the radius increasing when the area is 6 ft^2?

5. An automatic camera tracks a bird flying overhead.
If the bird flies at a height of 50 ft above the ground and constant speed of 30 ft/sec towards the camera, then how fast (in rad/sec) is the camera turning when the bird is directly above a point 20 ft away?

6. A giant balloon is inflated at a rate of 10 ft^3/min.
What is the rate of change of the diameter when the balloon is 10 ft across?
(Volume of sphere is $V = \frac{4}{3}\pi r^3$ and $d = 2r$.)

7. My daughter is taking a pottery class at CMC Arts. This weekend she made a cylindrical vase.
Suppose that the surface area remains constant while she squeezes the cylinder to become thinner and taller.
If she changes the height at a rate of 3 cm/min, then at what rate is the volume changing when the cylinder has height 10 cm and radius 4 cm?
(Use the following: $V = \pi r^2 h$ and $SA = 2\pi r h$.)