## MATH 30, SPRING 2020: RELATED RATES

1. Read the problem carefully.
2. Draw a picture if possible.
3. Introduce notation.
4. Express the given information mathematically.
5. Write an equation that relates the various quantities.
6. Use the Chain Rule.
7. Substitute into the resulting equation and solve for the related rate.

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1. A spherical balloon is being inflated so that its volume increases at a constant rate of 8 cubic feet per minute. Find the rate of increase of the radius when the radius is 3 feet.

2. A car is traveling east on the highway. A highway patrol officer is parked 90 feet north of the highway. The officer takes a radar reading and finds that the car is 150 feet from her position, and that the distance separating them is increasing at a rate of 72 feet per second. Find the speed of the car at that moment.

3. A laser pointer is placed on a platform that rotates at a rate of 20 revolutions ($40\pi$ radians) per minute. The beam hits a wall 8 meters away, producing a dot of light that moves horizontally along the wall. Let $\theta$ be the angle (in radians) between the beam and the perpendicular from the laser to the wall. How fast is this dot moving when $\theta = \dfrac{\pi}{6}$?

4. A boat is pulled toward a pier by means of a taut cable. If the boat is 20 feet below the level of the pier and the cable is pulled in at a rate of 36 feet per minute, how fast is the boat moving when it is 48 feet from the base of the pier?

5. Water is being poured into an inverted cone (vertex down) of radius 4 inches and height 10 inches at a rate of 3 cubic inches per second. Find the rate at which the water level is rising when the depth of the water over the vertex is 6 inches.

There are fun problems in the book, too! (See the homework.)