1. Suppose that the average yearly cost per item for producing x items of a business product is $C(x) = 10 + \dfrac{100}{x}$. If the current production is x = 10 and production is increasing at a rate of 2 items per year, find the rate of change of the average cost.

2. A camera tracks the launch of a vertically ascending spacecraft. The camera is located at ground level 2 miles from the launch pad. If the spacecraft is 3 miles up and traveling at 0.2 miles per second, at what rate is the camera angle changing (measured from the horizontal)?

3. Suppose a 6 foot tall person is 12 feet away from an 18 foot tall lamppost. If the person is moving away from the lamppost at a rate of 2 ft/sec, at what rate is the length of the shadow changing?

4. A dock is 6 feet above water. Suppose you stand on the edge of the dock and pull a rope attached to a boat at the constant rate of 2 ft/sec. At what speed is the boat approaching the dock when it is 20 feet from the dock? 10 feet from the dock?

5. Sand Is poured on to a conical pile with the height of the pile equaling the diameter of the pile. If the sand is poured at a constant rate of 5 cubic meters per second, at what rate is the height of the pile increasing when the height is 2 meters?

6. A water line runs east to west. A town wants to connect two new housing developments to the line by running lines from a single point on the existing line to the two developments. One development is 3 miles south of the existing line while the other is 4 miles south of the existing line and 5 miles east of the first development. Find the place on the existing line to make the connection to minimize the total length of new line. (How far east of the first development?)

7. Suppose that group tickets to a concert are priced at $40 per ticket if 20 tickets are ordered but cost $1 per ticket less for each additional ticket ordered, up to a maximum of 50 tickets. Find the number of tickets that maximizes the total cost of the tickets.

Answers:

1. - $2 per year

2. 0.03 rad / sec

3. 1 ft / sec

4. 2.088 ft/sec at 20 feet, 2.332 ft / sec at 10 feet

5. $\dfrac{5}{\pi}$ m / sec

6. 2.143 miles east of the first development

7. 30 tickets