Suppose that for a company manufacturing calculators, the cost, and revenue equations

are given by $C = 70000 + 40x$, $R = 400 - \dfrac{x^2}{20}$, where the production output

in one week is x calculators. If the production rate is increasing at a rate

of 500 calculators when the production output is 6000 calculators, find each

of the following:

1). Rate of change in cost.

2). Rate of change in revenue.

3). Rate of change in profit.

Solution:

1). Rate of change in cost is

$$\frac{dC}{dt} = \frac{dC}{dx} * \frac{dx}{dt}$$

$$\frac{dC}{dt} = 40\frac{dx}{dt}$$

$\frac{dx}{dt}$ is the production rate. $\frac{dx}{dt} = 500$, so

$\frac{dC}{dt} = 40 * 500 = 20,000.$

2). Rate of change in revenue is

$$\frac{dR}{dt} = \frac{dR}{dx} * \frac{dx}{dt}$$

$$\frac{dR}{dt} = -\frac{x}{10}\frac{dx}{dt}$$

$\frac{dx}{dt} = 500$ and $x = 6000$

$$\frac{dR}{dt} = -\frac{6000}{10} * 500 = -300,000$$

3). Rate of change in profit.

$$P(x) = R(x) - C(x) = -69,600 - \frac{x^2}{20} - 40x$$

$$\frac{dP}{dt} = \frac{dP}{dx} * \frac{dx}{dt}$$

$$\frac{dP}{dt} = -\frac{x}{10}\frac{dx}{dt} - 40\frac{dx}{dt} = -300,000 - 20,000 = -320,000$$