1. An environmental study of a particular community suggests that the average levels of carbon monoxide in the air is

$$c(p) = \sqrt{0.5p^2 + 17} \text{ parts per million}$$

parts per million where p is the population measured in thousands. It is estimated that t years from now, the population of the community will be

$$p(t) = 17.1 + 0.1t^2 \text{ thousand.}$$

At what rate will the carbon monoxide level be changing with respect to time 3 years from now? Interpret your answer.

2. An importer of Brazilian coffee estimates that local consumers will buy approximately

$$D(p) = \frac{4380}{p^2} \text{ pounds}$$

of coffee per week when the price is p dollars per pound. It is estimated that t weeks from now the price of Brazilian coffee will be

$$p(t) = 0.02t^2 + 0.1t + 7 \text{ dollars per pound.}$$

At what rate will the weekly demand for coffee be changing with respect to time 10 weeks from now? Interpret your answer.

3. A manufacturer estimates that when q units of a particular commodity are produced each month, the total cost will be

$$C(q) = 0.4q^2 + 3q + 40 \text{ dollars}$$

and that all q units can be sold at a price of

$$p(q) = 0.2(45 - 0.5q) \text{ dollars per unit.}$$

(a) Determine the level of production that results in maximum profit. What is the maximum profit?
(b) At what level of production is the average cost per unit minimized?
(c) At what level of production is the average cost equal to the marginal cost?