

# MTHSC 102 SECTION 4.1 – APPROXIMATING CHANGE

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## NOTE

The approximate change in  $f$  is caused by changing  $x$  to  $x + h$  for  $h$ , small can be approximated by

$$f(x + h) - f(x) \approx f'(x) \cdot h.$$

## FACT

*When the input  $x$  changes by a small amount  $h$  to  $x + h$ , the output  $f(x + h)$  can be approximated by*

$$f(x + h) \approx f(x) + f'(x) \cdot h.$$

## EXAMPLE

The temperature for a 2 hour period during and after a thunderstorm can be modeled by

$$T(h) = 2.37h^4 - 5.163h^3 + 8.69h^2 - 9.87h + 78 \text{ }^\circ\text{F},$$

where  $h$  is the number of hours since the storm began.

- 1 Use the rate of change of  $T(h)$  to at  $h = 0.25$  to estimate by how much the temperature changed between 15 and 20 minutes after the storm began.
- 2 Find the temperature and rate of change of temperature at  $h = 1.5$  hours.
- 3 Using only the answers to the last question, estimate the temperature 1 hour and 40 minutes after the storm began.

## DEFINITION

In Economics, it is customary to refer to the rates of change of cost, revenue and profit with respect to the number of units produced or sold as marginal cost, marginal revenue, and marginal profit.

## EXAMPLE

Suppose that a manufacturer of toasters currently produces 220 toasters per day with a total production cost of \$ 11,000 and a marginal cost of \$ 20 per toaster.

- 1 What information does the marginal cost value give the manufacturer?
- 2 If  $C(x)$  is the cost to produce  $x$  toasters, what is the notation for marginal cost?

## NOTE

Note that we have the relationship

$$\text{marginal profit} = \text{marginal revenue} - \text{marginal cost.}$$