Math 1b. Arc Length and the Average Value of a Function

Spring 2006

1. Find the length of the curve given by

$$y = \frac{2}{3}(x^2 - 1)^{3/2}$$

on the interval $[1, 3]$.

2. The arc length function for a function $f(t)$ beginning at the point $x = a$ is defined by

$$s(x) = \int_a^x \sqrt{1 + [f'(t)]^2}\, dt.$$

Calculate $s(x)$ for $y = x^{3/2}$, where $a = 1$.

3. How would you find the average temperature in Boston over a 24-hour period?

4. How would you calculate the average temperature in Boston given the following data?

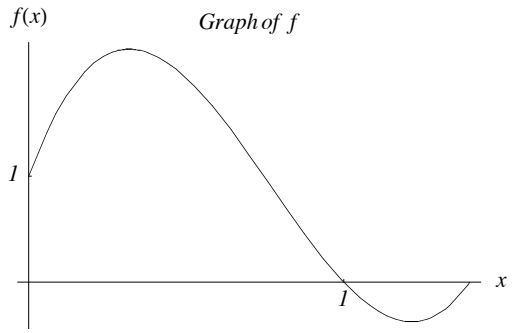
Time	Temperature
2 PM	68 °F
6 PM	68
10 PM	58
2 AM	55
6 AM	54
10 AM	65
2 PM	74

5. How would you calculate the average temperature in Boston given that the temperature is given by

$$f(t) = \frac{1}{9}t^2 - \frac{29}{12}t + 68,$$

where t is given in hours since 2 PM and $f(t)$ is given in degrees Fahrenheit?

6. The graph of some function f is given below. List the following values from *smallest* to *largest*.



   (a) $f'(1)$
   (b) The average value of $f(x)$ for $0 \leq x \leq a$.
   (c) The average value of the rate of change in $f(x)$ for $0 \leq x \leq a$.
   (d) $\displaystyle\int_0^a f(x)dx$.