1 Antiderivatives

1. Solve the initial-value problem (i.e., find an equation for y).

$$\frac{dy}{dt} = \sqrt{t} + \frac{2}{\sqrt{t}}, \quad t > 0,\ y(1) = 5.$$

2. Find f.

   (a) $f''(x) = 6x + 12x^2$.

   (b) $f''(x) = \sin\theta + \cos\theta, \quad f(0) = 3,\ f'(0) = 4$.

3. A particle moves a long a straight line with velocity function $v(t) = \sqrt{x}(6 + 5x)$. It's displacement at $t = 1$ is 10 m. Find its position function $s(t)$.

2 Integrals

1. Recall the following definition.

   The area A of the region S that lies under the graph of the continuous function f is the limit of the sum of the areas of approximating rectangles:

$$A = \lim_{n\to\infty} R_n = \lim_{n\to\infty} [f(x_1)\Delta x + \ldots + f(x_n)\Delta x] = \lim_{n\to\infty} \Sigma_{i=1}^{n} f(x_i)\Delta x.$$

   Use this definition to find an expression for the area under the graph of f as a limit. Do not evaluate the limit.

$$f(x) = \frac{2x}{x^2+1}, 1 \le x \le \pi/3.$$

2. A table of values of an increasing function f is shown. Use the table to find lower and upper estimates for $\int_{14}^{26} f(x)\,dx$.

x	14	18	22	26
$f(x)$	-6	-2	1	3

3. Evaluate the integral by interpreting it in terms of areas.

   (a) $\int_{-1}^{2} |x|\,dx$.

   (b) $\int_{-3}^{0} (1 + \sqrt{9 - x^2})\,dx$.