

M408C: Problem Set 11

Problem 1

Find the dimensions of a rectangle with area $1000m^2$ whose perimeter is as small as possible.

Problem 2

Find the most general antiderivative of the following functions:

$$f(x) = \sin(x) + \cos(x), \quad f(x) = 3\sqrt{x} - 2\sqrt[3]{x}, \quad f(x) = e^x - 2\sin(x).$$

Problem 3

Evaluate the following integrals by interpreting them in terms of areas:

$$\int_{-1}^2 (1-x) dx, \quad \int_0^9 (1 + \sqrt{9-x^2}) dx, \quad \int_0^1 |2x-1| dx.$$

Problem 4

Evaluate the integrals using the fundamental theorem of calculus:

$$\int_1^3 (x^2 + 2x - 4) dx, \quad \int_{-1}^1 x^{100} dx, \quad \int_1^9 \sqrt{x} dx.$$

Problem 5

Evaluate the integrals using the fundamental theorem of calculus:

$$\int_{\frac{\pi}{6}}^{\pi} \sin(x) dx, \quad \int_0^3 (2\sin(x) - e^x) dx, \quad \int_{\frac{1}{\sqrt{3}}}^{\sqrt{3}} \frac{8}{1+x^2} dx.$$