國立台灣海洋大學河海工程研究所 BEM 第 4 次作業(2004)

1. In the course, we have shown

$$\lim_{\varepsilon \to 0} \int_{-1}^{1} \frac{1}{x^2 + \varepsilon^2} dx = -2$$

2. In calculating the hypersingular integral, we can determine the improper integral by using limiting process. The *M* kernel contains two parts, one is calculated, the other one is as follows:

$$\lim_{x_2 \to 0} \int_{a}^{b} \frac{2x_2^2}{((x_1 - s_1)^2 + x_2^2)^2} ds_1 = ?$$

Please determine the value using Symbolic software (Macsyma, Reduce, Mathematica, Maple……)

$$\underset{\sim}{x} = (x_1, x_2)$$
$$\underset{\sim}{s} = (s_1, 0)$$
$$\underset{\sim}{n} = (0, 1)$$
$$\underset{\sim}{\bar{n}} = (0, 1)$$
$$\underset{\sim}{y} = (x_1 - s_1, x_2)$$
$$r^2 = (x_1 - s)^2 + x_2^2$$
$$M(s, x) = \frac{2 y_i y_j n_i \bar{n}_j}{r^4} - \frac{n_i \bar{n}_i}{r^2}$$