Physics 331

## Problem E

Derive the appropriate Euler-Lagrange equation for the case where the integral S has the form

$$S = \int_{x_1}^{x_2} f\Big(y(x), y'(x), y''(x), x\Big) \, dx$$

that is, where the integrand can depend on y'' as well as y and y'. The values of y and y' are specified at the end points  $x_1$  and  $x_2$ . This means the variation of the path,  $\eta(x)$ , must satisfy all of

$$\eta(x_1) = \eta(x_2) = 0$$
, and  $\eta'(x_1) = \eta'(x_2) = 0$ .