Lagrangian Mechanics Problem Set

$$\frac{\partial L}{\partial q} - \frac{d}{dt}\left(\frac{\partial L}{\partial \dot{q}}\right) = 0$$

1. Compute the following partial derivatives
   (a) $\frac{\partial}{\partial x}\, y\ln(x^2) - xw^2 + e^w$
   (b) $\frac{\partial}{\partial y}\, y\ln(x^2) - xw^2 + e^w$
   (c) $\frac{\partial}{\partial x}\, \cos(xy) + y^2$
   (d) $\frac{\partial}{\partial x}\, y\ln(x^2) - xw^2 + e^w$
   (e) $\frac{\partial}{\partial x}\, y^x + x^y$
   (f) $\frac{\partial}{\partial y}\, \cos(\sqrt{x^\pi}) - \ln(x!)$
   (g) $\frac{\partial}{\partial x}\, \sqrt{x+y}$
2. In Figure 1 we show a box of mass m sliding down a ramp of mass M. The ramp moves without friction on the horizontal plane and is located by coordinate x_1. The box also slides without friction on the ramp and is located by coordinate x_2 with respect to the ramp. Find $\ddot{x}_1$

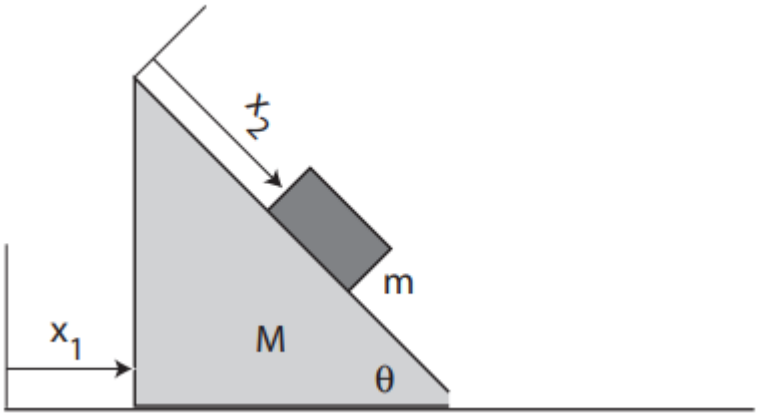

Figure 1

3.