

# ECE 463/663 Handout #6

## LaGrangian Dynamics

Assume

$$L = \cos(x) + \frac{1}{3}x\dot{x}^2t^3$$

Determine

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

## Solution

$$L = \cos(x) + \frac{1}{3}x\dot{x}^2t^3$$

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

$$F = \frac{d}{dt} \left( \frac{2}{3}x\dot{x}t^3 \right) - \left( -\sin(x) + \frac{1}{3}\dot{x}^2t^3 \right)$$

$$F = \left( \frac{2}{3}\dot{x}^2t^3 + \frac{2}{3}x\ddot{x}t^3 + \frac{6}{3}x\dot{x}t^2 \right) + \left( \sin(x) - \frac{1}{3}\dot{x}^2t^3 \right)$$