

### Jennings Dynamic Optimization Problem

$$\min_u t_f$$

$$s. t. \quad \frac{dx_1(t)}{dt} = u(t)$$

$$\frac{dx_2(t)}{dt} = \cos(x_1(t))$$

$$\frac{dx_3(t)}{dt} = \sin(x_1(t))$$

$$x(0) = \left[ \frac{\pi}{2}, 4, 0 \right]$$

$$x_2(t_f) = 0$$

$$x_3(t_f) = 0$$

$$-2 \leq u(t) \leq 2$$