Congestion Externality Example:

Suppose we want to reduce the amount of traffic in our city by implementing a congestion tax. Our PMB, PMC, & SMC are given by:

$$PMB = Cost = 100 - 10n$$
$$PMC = Cost = 20 + 10n$$
$$SMC = Cost = 25 + 15n$$

(i) Compute the private equilibrium (n^*, c^*)

$$100 - 10n = 20 + 10n$$
$$80 = 20n$$
$$n^* = 4$$

$$c^* = 20 + 10(4) = 60$$

$$\boxed{E2 = (4, 60)}$$

(ii) Compute the socially optimal E2 (n_s^*, c_s^*)

$$100 - 10x = 25 + 15x$$
$$75 = 25x$$
$$x = 3 = n_s^*$$

$$25 + 15(3) = 70 = c^*$$

(iii) Compute the socially optimal tax

The optimal tax is the external cost at the socially optimal u^*

$$EC = SMC - PMC = 25 + 15u - (20 + 10u)$$
$$= 5 - 5u$$

$$\Rightarrow \quad 5 - 5(3) = -10$$

(iv) Draw the tax