Name: _____

In-Class Activity

PS200C: Causal Inference in the Social Sciences
Spring 2026

1. **What is the causal question?**
   Which of the following best captures the causal question in the potential outcomes framework?
   (a) Compare average outcomes between treated and untreated groups
   (b) Compare outcomes for the same unit under treatment vs. control
   (c) Compare treated units to similar control units
   (d) Compare before-and-after outcomes for treated units

2. **Observability**
   For a given unit i, classify each as *always observable*, *sometimes observable*, or *never observable*:
   - $Y_i(1)$ and $Y_i(0)$ (both at once)
   - D_i
   - Y_i
   - $\tau_i = Y_i(1) - Y_i(0)$

3. **Difference in Means**
   Consider:
   $$\mathbb{E}[Y_i \mid D_i = 1] - \mathbb{E}[Y_i \mid D_i = 0]$$
   Which is correct?
   (a) Always equals ATE
   (b) Always equals ATT
   (c) Equals ATT plus selection bias
   (d) Equals ATC

4. **Direction of Bias**
   Suppose:
   - $Y_i(1) = Y_i(0)$ for all i (no treatment effect)
   - Treatment is more likely for units with higher $Y_i(1)$

   What do you expect for:
   $$\mathbb{E}[Y_i \mid D_i = 1] - \mathbb{E}[Y_i \mid D_i = 0]\,?$$
   (a) Zero

(b) Positive
(c) Negative

5. **Science Table**

i	D_i	$Y_i(1)$	$Y_i(0)$
1	1	10	4
2	1	1	2
3	0	3	3
4	0	5	2

Compute:

- ATE:
- ATT:

6. **Bonus:**
Why does

$$\mathbb{E}[Y_i(1) \mid D_i = 1] = \mathbb{E}[Y_i \mid D_i = 1]$$

hold?