1. Consider altruistic preferences: $U_i(X) = x_i + \alpha x_{-i}$
    a. Can one use this to explain 50% contribution in the public goods game?
    b. Can one use this to explain nearly full contribution in the public goods game with punishment?
    c. Can one use this to explain rejections and fair offers in the ultimatum game?
2. Consider the inequality aversion model of Fehr and Schmidt (1999) having guilt-envy preferences: $U_i(X) = x_i - \frac{\alpha}{n-1}\sum_{k \neq i} \max(x_k - x_i, 0) - \frac{\beta}{n-1}\sum_{k \neq i} \max(x_i - x_k, 0)$.
    a. Attempt Question 4 of the 2008 Midterm Exam.
    b. Demonstrate how such preference can explain rejections in the ultimatum game. (Hint: This is similar to costly punishment after a public goods game.) What about 50-50 offers?
    c. Can one use this to explain 50-50 or zero offers in the dictator game? What about other offers that were in between?
    d. Can one use this to explain ultimatum game results with competing proposers (all propose 1-99) or competing respondents (all accepting 99-1)?
3. Consider the fairness equilibrium proposed by Rabin (1993):

Two Players: 1 & 2; Strategy: a_i; i'th belief about other's strategy : $b_j \left(= b_{3-j}\right)$; i'th belief about other's belief : c_i. For $\pi_2\left(b_2\right)$=possible payoffs of 2 given b_2 (belief about 2's action) equitable(ex: $\frac{\pi^{\max} + \pi^{\min}}{2}$ excluding Pareto dominated), define **Kindness (of 1 toward 2) :**

$$f_1\left(a_1, b_2\right) = \frac{\pi_2\left(b_2, a_1\right) - \pi_2^{fair}\left(b_2\right)}{\pi_2^{\max}\left(b_2\right) - \pi_2^{\min}\left(b_2\right)},\ f_1 > 0 \text{ :kind; } f_1 < 0 \text{ :mean}$$

Perceived kindness (of what 1 think about 2's kindness to her):

$$\tilde{f}_2\left(b_2, c_1\right) = \frac{\pi_1\left(c_1, b_2\right) - \pi_1^{fair}\left(c_1\right)}{\pi_1^{\max}\left(c_1\right) - \pi_1^{\min}\left(c_1\right)}$$

Social Utility function(for 1)

$$u_1\left(a_1, b_2, c_1\right) = \pi_1\left(a_1, b_2\right) + \alpha \cdot \tilde{f}_2\left(b_2, c_1\right) + \alpha \cdot \tilde{f}_2\left(b_2, c_1\right) \cdot f_1\left(a_1, b_2\right)$$

Eq. requires $a_i = b_i = c_i \left(a_1 = b_1 = c_1, a_2 = b_2 = c_2\right)$

   a. Can one sustain (C, C) as a fairness equilibrium in the prisoner's dilemma?

	C	D
C	4, 4	$-\varepsilon$, 6
D	6, $-\varepsilon$	0, 0

b. Can one sustain both (C, C) and (D, D) as fairness equilibria in the chicken game?

	C	D
C	-2, -2	2, 0
D	0, 2	1, 1

c. Consider an ultimatum offer of (8, 2), and two possible rejection outcomes (0.8, 0.2) and (6,0). Empirical rejection rates are 38% and 19%, respectively. Can fairness equilibrium explain the empirical results? What about guilt-envy preferences?