Problem 1

Midterm 1 recap. Solutions will be on Canvas.

Problem 2

True or false? Leniency programs

(a) Are excellent examples of the prisoner's dilemma.

False. There are two equilibria in the leniency game, one of which is cooperation with the best possible payoff for both players.

(b) Prevent the abuse of a dominant market position.

False. Leniency isn't about trying to break up a near monopoly; it's about trying to break up a cartel.

(c) Are more effective when cartel members are impatient.

True. If cartel members are impatient, then they don't really value the future benefits of a cartel all that much. This makes it more likely that the perceived benefit of remaining in the cartel is overshadowed by the perceived threat of being criminally prosecuted.

(d) Involve criminal penalties for cartel participants.

True. There has to be some incentive for a cartel member to cooperate with regulators. The incentive comes from allowing the first cartel member who cooperates with regulators to avoid criminal prosecution.

Problem 3

Firm A and Firm B have formed a cartel. The Department of Justice (DOJ) suspects as much and wants to offer leniency to tempt either of the firms to expose the cartel. The possible actions and payoffs are as follows:

- If neither firm cooperates with the DOJ, then both receive payoff of $10 million.

- If one firm cooperates with the DOJ and the other doesn't, then the firm that cooperates with the DOJ receives a payoff of $5 million (they are fined and no longer receive such high cartel profit); and the firm that doesn't cooperate with the DOJ receives a payoff of −$5 million (they are fined, no longer receive the high cartel profit, and serve time in prison).

- If both firms cooperate with the DOJ, then both firms receive a payoff of $5 million (both are fined, neither receive the high cartel profit, but neither serve time in prison).

Answer the following questions:

(a) Is this game a prisoner's dilemma?

Solution. The pair of values (x, y) denotes Firm A and Firm B payoff, respectively. We can write the game as

Firm B

		Cartel	DOJ
Firm A	Cartel	$\mathbf{10, 10}$	$-5, 5$
	DOJ	$\mathbf{5, -5}$	$\mathbf{5, 5}$

There are two Nash equilibria: both play Cartel/Cartel, and both play DOJ/DOJ. Therefore it is not a prisoner's dilemma: the Cartel/Cartel outcome gives the best payoff for both players and also is a Nash equilibrium. If this were a prisoner's dilemma, then only the DOJ/DOJ outcome would be a Nash equilibrium.

Obvious followup question: which equilibrium will actually be the outcome?

(b) Let p denote the probability with which Firm A believes Firm B will cooperate with the DOJ. For what values of p will Firm A choose to cooperate with the DOJ?

Solution. Suppose Firm A does not cooperate with the DOJ. Then Firm A's expected payoff is $(1 - p)(10) + p(-5) = 10 - 15p$.

Suppose Firm A does cooperate with the DOJ. Then Firm A's expected payoff is $(1 - p)(5) + p(5) = 5$.

Therefore Firm A cooperates with the DOJ when

$$5 > 10 - 15p \quad \implies \quad p > \frac{1}{3}.$$

In other words, Firm A will choose to cooperate with the DOJ when it believes the probability of Firm B also cooperating with the DOJ is sufficiently high. If $p < 1/3$, then the possibility of Firm B cooperating with the DOJ is small enough that the prospect of criminal prosecution is very unlikely, which makes the Cartel option relatively attractive.