1. Cartel Question
Suppose that we have $N$ firms in a cartel. The industry that has the demand curve:

$$Q^D = 10 - \frac{P}{2}$$

These firms have cost curves given by $C(Q) = 4Q$. Firms compete in prices, NOT quantities. Firms have discount rate $\delta = 0.5$. Firms use grim trigger strategies to punish their rivals.

(a) For how many firms will this cartel be stable?

(b) Now suppose that there are only $N = 2$ firms in the industry. Firm 1 has a discount rate of $\delta = 0.4$, whereas firm 2 has a discount rate of $\delta = 0.8$. Which firm will want to defect and why? Discuss.

(c) Suppose that instead of allocating market shares 50/50 between cartel members, the cartel can allocate different market shares to different members. How could it allocate $s$ (market share going to firm 1, $1-s$ goes to firm 2), in such a way as to make the cartel stable? Who gets a larger market share?

2. Bertrand and Cartels
The DOJ is investigating allegation of collusion in the snowplow industry. Demand for snowplows is given by the inverse demand curve:

$$P = 35 - 5Q$$

While firms have cost curves given by:

$$C(Q) = 5Q$$

There are 3 firms in the snowplow industry. Each firm has a discount rate of $\delta = \frac{3}{5} = 0.6$.

(a) (3 points) Suppose that these firms compete a la Bertrand in this market (simultaneous price setting). What will prices and quantities be?

(b) (5 points) Suppose that these firms act as a Monopoly Cartel, with grim trigger punishments after defection. What will be the cartel price, and is this Cartel stable?

(c) (5 points) Now suppose that two firms, Snowking and Mr. Plow, merge. What is the effect of this merger, both if firms do not collude, and if they might?

(d) (2 points) Now suppose, that as before, there are 3 firms in the industry. However, these firms also operate in two cities — call these A and B. Will collusion be sustainable with this multi-market contact?

3. (5 points) In the Apple Ebooks Case, how did the collusive mechanism work. How does it link into the models in the previous two questions.