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## Homework Assignment 1

**The assignment is due by Thursday, June 6, 23:59.  
Late submissions will be awarded 0 (zero).**

1. A suburb of Corpus Christi has experienced water contamination problems:

CBS NEWS December 16, 2016, 8:21 AM

### Corpus Christi water ban: Resident calls it a "huge failure" of city

Residents in outlying parts of Corpus Christi, Texas have the all-clear to use their water again. Officials say between three and 24 gallons of a potentially harmful chemical leaked into the water supply. They told all residents Wednesday to avoid tap water for any use.

CBS News correspondent Manuel Bojorquez found one family restaurant that was shut down by the water crisis. While the water looks fine inside, this restaurant and other businesses cannot reopen until the city says the water is safe.

“What do we want? Clean water!” protesters chanted.

Some people in Corpus Christi said they are battling against chemicals many residents have never heard of.

“There were two types of chemicals and I’m not the chemical expert, so I relied on several people,” said Dan McQueen, mayor of the city of more than 320,000. “We don’t think it was introduced to anybody in our city other than the industrial district.”

On Wednesday, workers at an asphalt refinery noticed an oily sheen coming from a faucet at their complex and alerted the city. Petroleum-based chemicals found in asphalt can be hazardous, and in concentrated amounts, will burn the skin and damage the body’s digestive system.

The city’s warning prompted a rush at grocery stores. Carol Madden said she could only take home three liters.

“Well, we woke up and there was a ban on using all water. No washing your hands, brushing your teeth, taking a shower,” Madden.

Isabel Araiza said she and other members of this community have been meeting since the city’s last water issue happened back in May.

“Everybody’s running around trying to collect water and basically, this is a huge failure of providing good services for the community,” Araiza said.

“I think people are wondering whether the city can keep the water safe?” Bojorquez asked.

“Let me tell you something -- this was not a water boil. This was a third party that has been identified, and I believe it’s in the press so far and we will hold them accountable, but they contaminated our water supply,” the mayor said.

“What can the city do then to prevent this type of contamination from happening again?” Bojorquez asked.

“My number one concern right now is the public is safe. We can get you guys, get the city back operating again,” McQueen said.

Argon has sued a third-party contractor over the contamination, but that contractor has denied responsibility. In the meantime, officials here are reportedly looking into whether other chemicals -- like hydrochloric acid -- may be in the water. But so far, there have been no reported illnesses and no word that anyone has actually ingested tainted water.

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Not surprisingly, a class action lawsuit has been filed by the residents soon after the events (affected businesses filed a lawsuit within hours of the accident). We will try to analyze the situation, and for that we need some assumptions about the damages and costs.

Suppose the suburb population affected is 10,000 people. The people of the suburb could be drinking the water (the taps are still running). If they do drink the water, they may experience stomach aches etc., and we estimate that the medical bills and discomfort amount to \$600 a year per person, on average. The polluter (“a third party that has been identified” in the article) could install backflow preventer (technological solution) that stops the leakage. Installing this backflow preventer would cost the polluter \$3 million a year. Alternatively, the people affected could buy (clear) bottled water in the stores. Bottled water would cost each shopper \$250 a year, on average.

- a. What is the efficient solution? **(2 points)**
- b. Let us say the court decides the polluter has no legal obligation to prevent chemical leaks. What will happen if there is no bargaining between the suburb residents and the polluter? What will happen if the polluter and the suburb residents can successfully bargain? **(2 points)**
- c. Let us say a court rules that the polluter is responsible for its chemical leaks, so that it must either stop the leaking (which it could do by installing the backflow preventer) or pay each resident for the damages. What will happen if there is no bargaining between the suburb residents and the polluter? What will happen if the polluter and the suburb residents can successfully bargain? **(2 points)**

- d. Is it likely that the suburb residents and the polluter can successfully bargain to settle the problem? Explain why. **(2 points)**
- e. How should the court decide the case? Explain why. **(2 points)**
2. Suppose that a railroad runs beside a field in which commercial crops are grown. The railroad is powered by a steam locomotive that spews hot cinders out of its smokestack. From time to time those cinders land on the crops nearest to the track and burn them to the ground. Assume that each year, the farmer whose crops are burned loses \$3,000 in profits, and that the annual cost to the railroad of installing and maintaining a spark-arrester that would prevent any damage to the crops is \$1,750. Does it matter to the efficient use of the farmer's land or to the efficient operation of the railroad whether the law protects the farmer from invasion by sparks or allows the railroad to emit sparks without liability? Why or why not? Explain. **(4 points)**
3. Suppose that a railroad runs beside a field in which commercial crops are grown. The railroad is powered by a steam locomotive that spews hot cinders out of its smokestack. From time to time those cinders land on the crops nearest to the track and burn them to the ground. Assume there are many farmers whose crops are burned. Their losses depend on the number of trains that run per day. The railroad's profits and the farmers' losses are shown in the table:

Number of trains per day	Railroad's profits	Harm caused to crops
0	\$0	\$0
1	\$2,000	\$1,500
2	\$5,000	\$4,000
3	\$9,000	\$6,000
4	\$10,500	\$8,000
5	\$10,000	\$10,000

The transaction costs are too high for the railroad and the farmers to negotiate. There are no reasonable mechanisms to reduce the fires (no spark arrester at reasonable cost, no change to other crops, etc.) for a given number of trains.

- a. What is the efficient number of trains to run per day? Explain. **(2 points)**
- b. If the railroad's right to run its trains is protected by the *property rule*, how many trains will it run? Explain. **(2 points)**
- c. If the farmers' right to have the crops free from fires is protected by the *property rule*, how many trains will the railroad run? Explain. **(2 points)**

- d. If the farmers' right to have the crops free from fires is protected by the *liability rule*, how many trains will the railroad run? Explain. **(2 points)**
4. Discuss why it is efficient to limit the duration of patents by a shorter term, limit the duration of copyrights by a longer term, and let the real property rights endure almost forever. **(4 points)**



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