

1) Public Goods.

- a. Define the concepts of rivalry and exclusion as they apply to goods, and use them to illustrate the difference between private and public goods.

- b. Fill in the table. Which type of good from (b) goes where?

	Exclusion Possible	No Exclusion Possible
Rivalry		
No Rivalry		

- c. Discuss how and why derivation of the demand curve for public goods differs from the derivation of the demand curve for a private good.

2) Two people live next door to each other on a bay, and are the only residents on the bay. During storms, high waves cause property damage on each person's property. By building a breakwater near the mouth of the bay, they can avoid this damage to their shoreline. The only place that it is feasible to build this breakwater will provide this protection to both properties. Dorothy owns one of the houses, and spends \$13,000 repairing her property from the storm damage. Henry owns the other house, and spends \$3,000 repairing his property. Building the breakwater costs \$10,000. If they both agree to build it, they share the cost of building equally (\$5,000 each).

- a. Is the total benefit (as reflected in the benefit of not having to pay to repair storm damage) greater than the cost? You can assume both the damage repair costs and the building cost are in present value terms.

- b. Explain how the Nash Equilibrium outcome of this game illustrates the free rider problem in the provision of public goods.

		Dorothy			
		Build		Don't Build	
Henry	Build	-\$5,000	-\$5,000	-\$10,000	\$0
	Don't Build	\$0	-\$10,000	-\$3,000	-\$13,000

- c. Does the free rider problem in this example lead to an inefficient outcome?

3) Public goods, voting, and benefit cost.

Jordan Elbridge High School is trying to decide what physical plant improvements to make to the High School Property. There are five families in the school district who will vote on the improvements. They are confronted with three proposals:

Proposal A: Replace wastewater treatment plant, connect to municipal sewage system, and replace and improve drainage system. Total cost is \$3,000 (\$600 each).

Proposal B: All of what is in proposal A plus a new artificial turf playing field surrounded by an all season track. Total cost is \$10,000 (\$2,000 each).

Proposal C: All of what is in proposal B plus heated locker rooms and stadium rest rooms. Total cost is \$20,000 (\$4,000 each)

This table records each household's WTP for each proposal.

	Proposal A	Proposal B	Proposal C
Taylor	\$1,000	\$1,800	\$3,500
Feeney	\$500	\$3,500	\$3,500
Badger	\$500	\$1,800	\$9,500
Bennett	\$1,600	\$1,900	\$3,000
McPeak	\$700	\$1,500	\$3,500

- a) Each household gets one yes vote. If they have WTP greater than cost for more than one proposal, they will give their yes vote to the proposal that has the greater difference between WTP and cost to that household. How will they vote? (circle)

	Proposal A		Proposal B		Proposal C	
Taylor	Yes	No	Yes	No	Yes	No
Feeney	Yes	No	Yes	No	Yes	No
Badger	Yes	No	Yes	No	Yes	No
Bennett	Yes	No	Yes	No	Yes	No
McPeak	Yes	No	Yes	No	Yes	No

- b) If the costs are present value costs, and the willingness to pay figures are present value benefits, what is the net present value of each proposal?

Proposal A	Proposal B	Proposal C

- c) Did voting lead us to select the proposal that had the highest net present value? Explain why or why not.

4) Public goods. There are three people who live in a town. They each have a demand curve for the number of snowplows (q is the # of snowplows here) that will keep the streets clear in the winter. Frosty has a willingness to pay for the number of snowplows defined by $50-10*q$. Rudolph has a willingness to pay for the number of snowplows defined by $120-20*q$. Kris has a willingness to pay for the number of snowplows defined by $300-10*q$.

a. Draw these individual demand curves and the societal demand curve for this public good.

b. If the marginal cost of snowplows is constant at 270 per snowplow and no effort is made to avoid the free rider problem, what number of snowplows will be provided and who will provide it?

c. How much less is this than the socially optimal number of snowplows if the cost is 270 per snowplow?