SOLUTIONS TO TEXT PROBLEMS:

Quick Quizzes

1. Public goods are goods that are neither excludable nor rival. Examples include national defense, knowledge, and uncongested nontoll roads. Common resources are goods that are rival but not excludable. Examples include fish in the ocean, the environment, and congested nontoll roads.

2. The free-rider problem occurs when people receive the benefits of a good but avoid paying for it. The free-rider problem induces the government to provide public goods because if the government uses tax revenue to provide the good, everyone pays for it and everyone enjoys its benefits. The government should decide whether to provide a public good by comparing the good's costs to its benefits; if the benefits exceed the costs, society is better off.

3. Governments try to limit the use of common resources because one person's use of the resource diminishes others' use of it, so there is a negative externality which leads people to use common resources excessively.

Questions for Review

1. An excludable good is one that people can be prevented from using. A rival good is one for which one person's use of it diminishes another person's enjoyment of it. Pizza is both excludable, since a pizza producer can prevent someone from eating it who doesn't pay for it, and rival, since when one person eats it, no one else can eat it.

2. A public good is a good that is neither excludable nor rival. An example is national defense, which protects the entire nation. No one can be prevented from enjoying the benefits of it, so it is not excludable, and an additional person who benefits from it does not diminish the value of it to others, so it is not rival. The private market will not supply the good, since no one would pay for it because they cannot be excluded from enjoying it if they don't pay for it.

3. Cost-benefit analysis is a study that compares the costs and benefits to society of providing a public good. It is important because the government needs to know which public goods people value most highly and which have benefits that exceed the costs of supplying them. It is hard to do because quantifying the benefits is difficult to do from a questionnaire and because respondents have little incentive to tell the truth.

4. A common resource is a good that is rival but not excludable. An example is fish in the ocean. If someone catches a fish, that leaves fewer fish for everyone else, so it's a rival good. But the ocean is so vast, you cannot charge people for the right to fish, or prevent them from fishing, so it is not excludable. Thus, without government intervention, people will use the good too much, since they don't account for the costs they impose on others when they use the good.

Problems and Applications

1. a. The externalities associated with public goods are positive. Since the benefits from the public good received by one person don't reduce the benefits received by anyone else, the social value of public goods is substantially greater than the private value. Examples include national defense, knowledge, uncongested non-toll roads, and uncongested parks. Since public goods aren't excludable, the free-market quantity is zero, so it is

less than the efficient quantity.

b. The externalities associated with common resources are generally negative. Since common resources are rival but not excludable (so not priced) the use of the common resources by one person reduces the amount available for others. Since common resources are not priced, people tend to overuse them—their private cost of using the resources is less than the social cost. Examples include fish in the ocean, the environment, congested non-toll roads, the Town Commons, and congested parks.

2. a. (1) Police protection is a natural monopoly, since it is excludable (the police may ignore some neighborhoods) and not rival (unless the police force is overworked, they're available whenever a crime arises). You could make an argument that police protection is rival, if the police are too busy to respond to all crimes, so that one person's use of the police reduces the amount available for others; in that case, police protection is a private good.

(2) Snow plowing is most likely a common resource. Once a street is plowed, it isn't excludable. But it is rival, especially right after a big snowfall, since plowing one street means not plowing another street.

(3) Education is a private good (with a positive externality). It is excludable, since someone who doesn't pay can be prevented from taking classes. It is rival, since the presence of an additional student in a class reduces the benefits to others.

(4) Rural roads are public goods. They aren't excludable and they aren't rival since they're uncongested.

(5) City streets are common resources when congested. They aren't excludable, since anyone can drive on them. But they are rival, since congestion means every additional driver slows down the progress of other drivers. When they aren't congested, city streets are public goods, since they're no longer rival.

b. The government may provide goods that aren't public goods, such as education, because of the externalities associated with them.

3. a. Charlie is a free rider.

b. The government could solve the problem by sponsoring the show and paying for it with tax revenue collected from everyone.

c. The private market could also solve the problem by making people watch commercials that are incorporated into the program. The existence of cable TV makes the good excludable, so it would no longer be a public good.

4. a. Since knowledge is a public good, the benefits of basic scientific research are available to many people. The private firm doesn't take this into account when choosing how much research to undertake; it only takes into account what it will earn.

b. The United States has tried to give private firms incentives to provide basic research by subsidizing it through organizations like the National Institute of Health and the National Science Foundation.

c. If it's basic research that adds to knowledge, it isn't excludable at all, unless people in other countries can be prevented somehow from sharing that knowledge. So perhaps U.S. firms get a slight advantage because they hear about technological advances first, but knowledge tends to diffuse rapidly.

5. When a person litters along a highway, others bear the negative externality, so the private costs are low. Littering in your own yard imposes costs on you, so it has a higher private cost and is thus rare.

6. When the system is congested, each additional rider imposes costs on other riders. For example, when all seats are taken, some people must stand. Or if there isn't any room to stand, some people must wait for a train that isn't as crowded. Increasing the fare during rush hour internalizes this externality.

7. On privately owned land, the amount of logging is likely to be efficient. Loggers have incentives to do the right amount of logging, since they care that the trees replenish themselves and the forest can be logged in the future. Publicly owned land, however, is a common resource, and is likely to be overlogged, since loggers won't worry about the future value of the land.

   Since public lands tend to be overlogged, the government can improve things by restricting the quantity of logging to its efficient level. Selling permits to log, or taxing logging, could be used to reach the appropriate quantity by internalizing the externality. Such restrictions are unnecessary on privately owned lands, since there is no externality.

8. a. Overfishing is rational for fishermen since they're using a common resource. They don't bear the costs of reducing the number of fish available to others, so it's rational for them to overfish. The free-market quantity of fishing exceeds the efficient amount.

   b. A solution to the problem could come from regulating the amount of fishing, taxing fishing to internalize the externality, or auctioning off fishing permits. But these solutions wouldn't be easy to implement, since many nations have access to oceans, so international cooperation would be necessary, and enforcement would be difficult, because the sea is so large that it is hard to police.

   c. By giving property rights to countries, the scope of the problem is reduced, since each country has a greater incentive to find a solution. Each country can impose a tax or issue permits, and monitor a smaller area for compliance.

   d. Since government agencies (like the Coast Guard in the United States) protect fishermen and rescue them when they need help, the fishermen aren't bearing the full costs of their fishing. Thus they fish more than they should.

   e. The statement, "Only when fishermen believe they are assured a long-term and exclusive right to a fishery are they likely to manage it in the same far-sighted way as good farmers manage they land," is sensible. If fishermen owned the fishery, they would be sure not to overfish, because they would bear the costs of overfishing. This is a case in which property rights help prevent the overuse of a common resource.

   f. Alternatives include regulating the amount of fishing, taxing fishermen, auctioning off fishing permits, or taxing fish sold in stores. All would tend to reduce the amount of fishing from the free-market amount toward the efficient amount.

9. The private market provides information about the quality or function of goods and services in several different ways. First, producers advertise, providing people information about the product and its quality. Second, private firms provide information to consumers with independent reports on quality; an example is the magazine *Consumer Reports*. The government plays a role as well, by regulating advertising, thus preventing firms from exaggerating claims about their products, regulating certain goods like gasoline and food to be sure they are measured properly and provided without disease, and not allowing dangerous products on the market.

10. To be a public good, a good must be neither rival nor excludable. When the Internet isn't congested, it is not rival, since one person's use of it does not affect anyone else. However, at times traffic on the Internet is so great that everything slows down—at such times, the Internet is rival. Is the Internet excludable? Since anyone operating a Web site can charge a customer for visiting the site by requiring a password, the Internet is excludable. Thus the Internet is not strictly a public good. Since the Internet is usually not rival, it is more like a natural monopoly than a public good. However, since most people's Web sites contain information and exclude no one, the majority of the Internet is a public good (when it is not congested).

11. Recognizing that there are opportunity costs that are relevant for cost-benefit analysis is the key to answering this question. A richer community can afford to place a higher value on life and safety. So the richer community is willing to pay more for a traffic light, and that should be considered in cost-benefit analysis.