Chapter 11: Externalities and Property Rights

Monday, July 19

DEFINITIONS

***external cost (or negative externality)*: a cost of an activity that falls on people other than those who pursue the activity**

***external benefit (or positive externality)*: a benefit of an activity received by people other than those who pursue the activity**

POLLUTION: A NEGATIVE EXTERNALITY

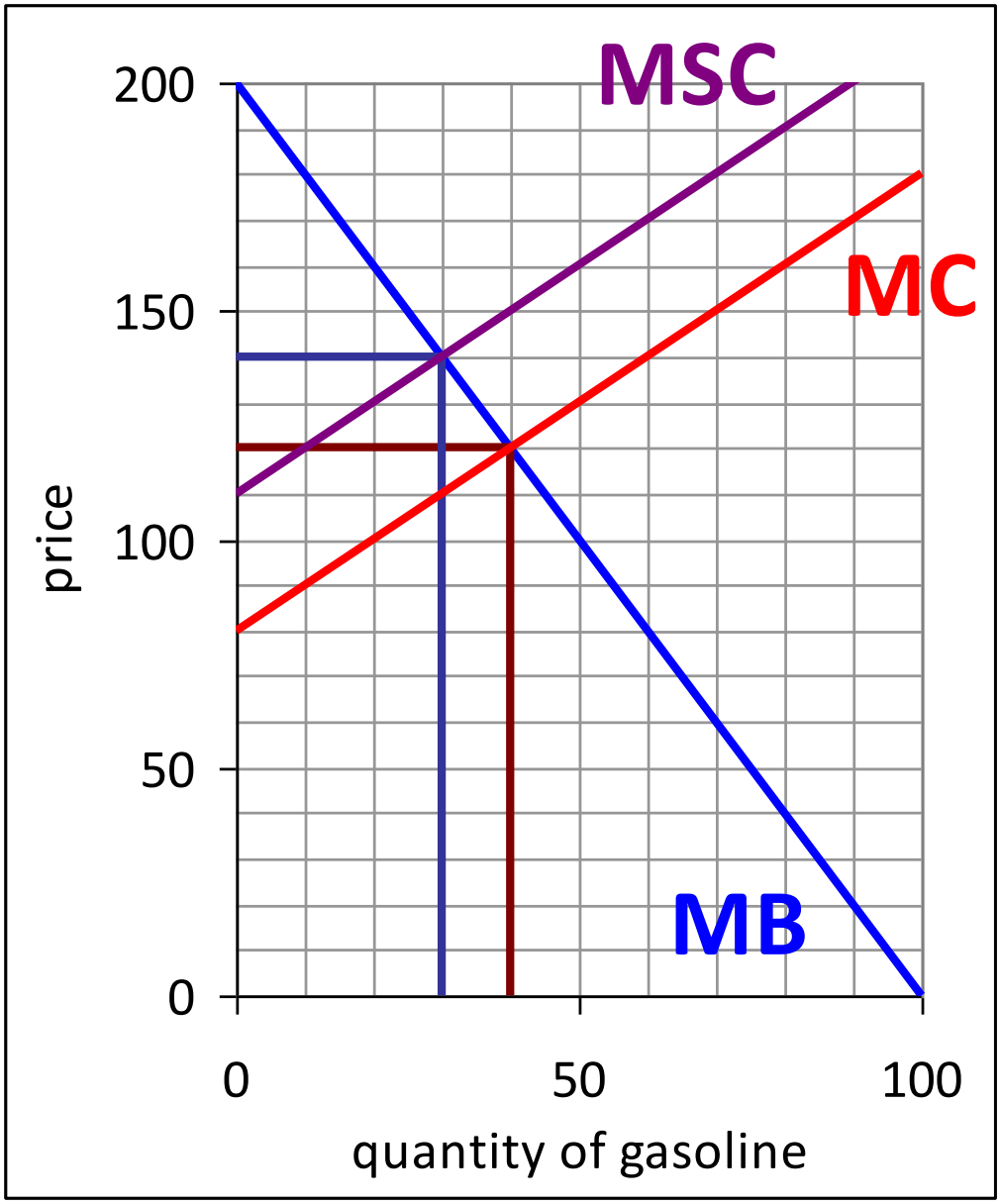
Suppose that the marginal benefit from gasoline consumption is given by the function MB = 200 – 2Q (where Q is the quantity of gasoline), and the marginal cost *to producers* of production of gasoline is given by the function MC = 80 + Q.

What we have here are the marginal *private* costs and benefits of gasoline, i.e. the costs that sellers must pay to produce, and the costs that buyers get directly from consuming.

However, suppose that every unit of gasoline emits pollution that inflicts an estimated $30 worth of harm to society in general, rather than the buyer or seller in particular. This is called a marginal external cost (MEC) Then we have the *marginal social cost* function MSC = MC + MEC = (80 + Q) + 30

So, MSC = 110 + Q

NEGATIVE EXTERNALITY: GRAPH



marginal private benefit

MB = 200 – 2Q

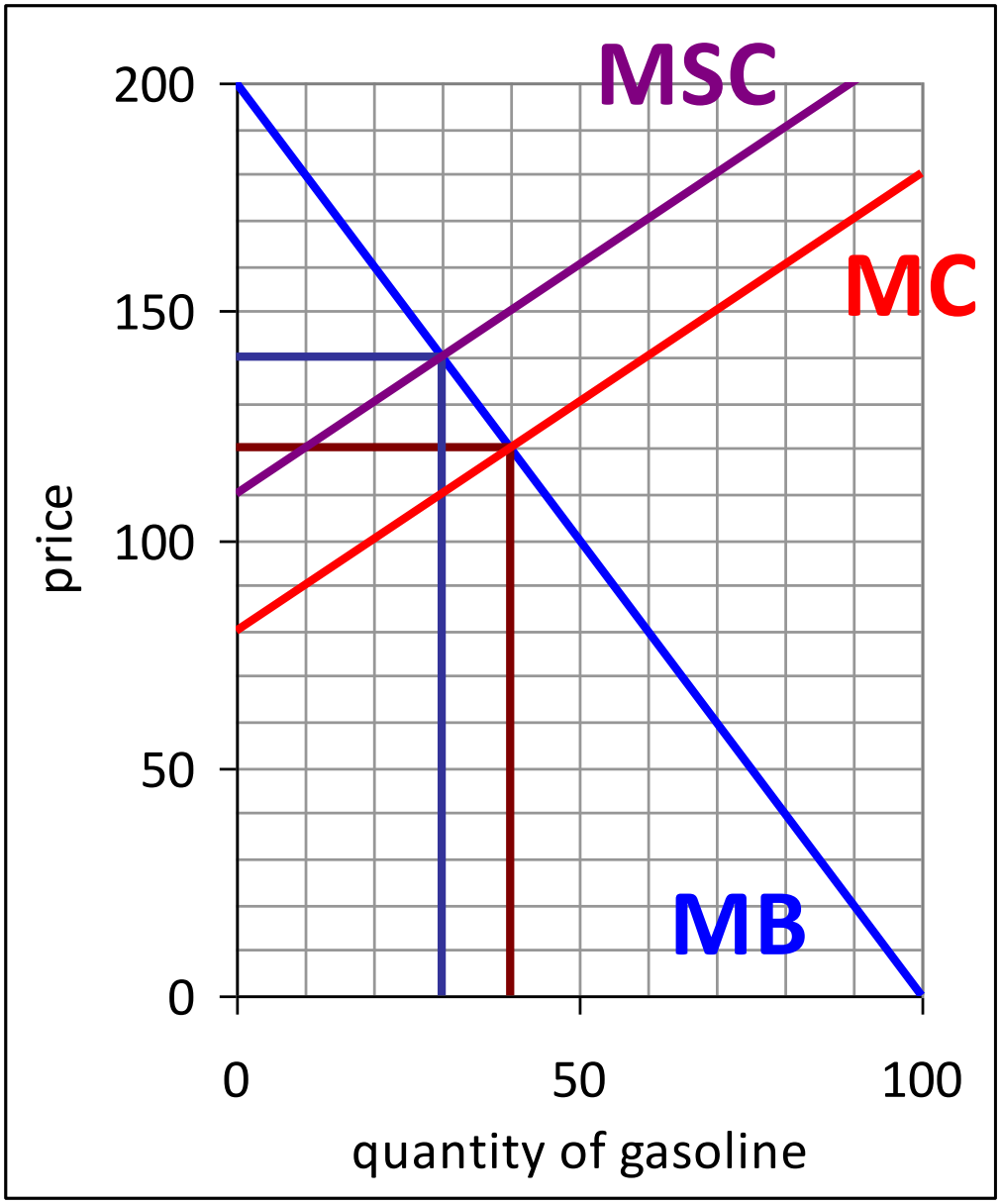
marginal private cost
MC = 80 + Q

marginal external cost
MEC = 30

marginal social cost (private + external)

MSC = 110 + Q

NEGATIVE EXTERNALITY: MARKET EQUILIBRIUM



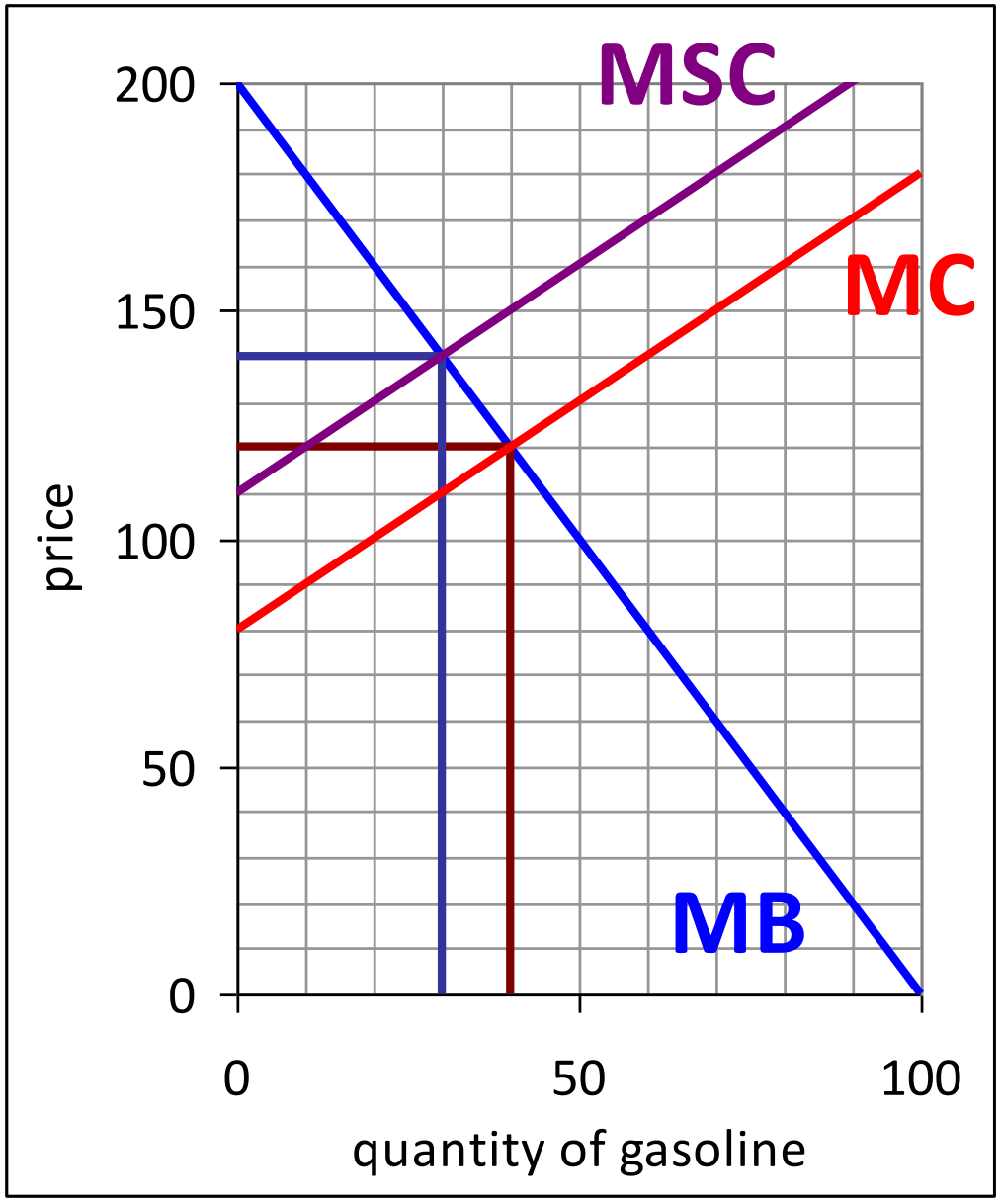
MB = 200 – 2Q
MC = 80 + Q
MEC = 30
MSC = 110 + Q

If neither buyers nor sellers of gasoline are required to directly pay for the cost imposed by the pollution they create, then the market equilibrium simply doesn't take it into account.

200 – 2Q = 80 + Q

3Q = 120, $Q^* = 40$ is the market equilibrium.

NEGATIVE EXTERNALITY: SOCIAL OPTIMUM



MB = 200 – 2Q
MC = 80 + Q
MEC = 30
MSC = 110 + Q

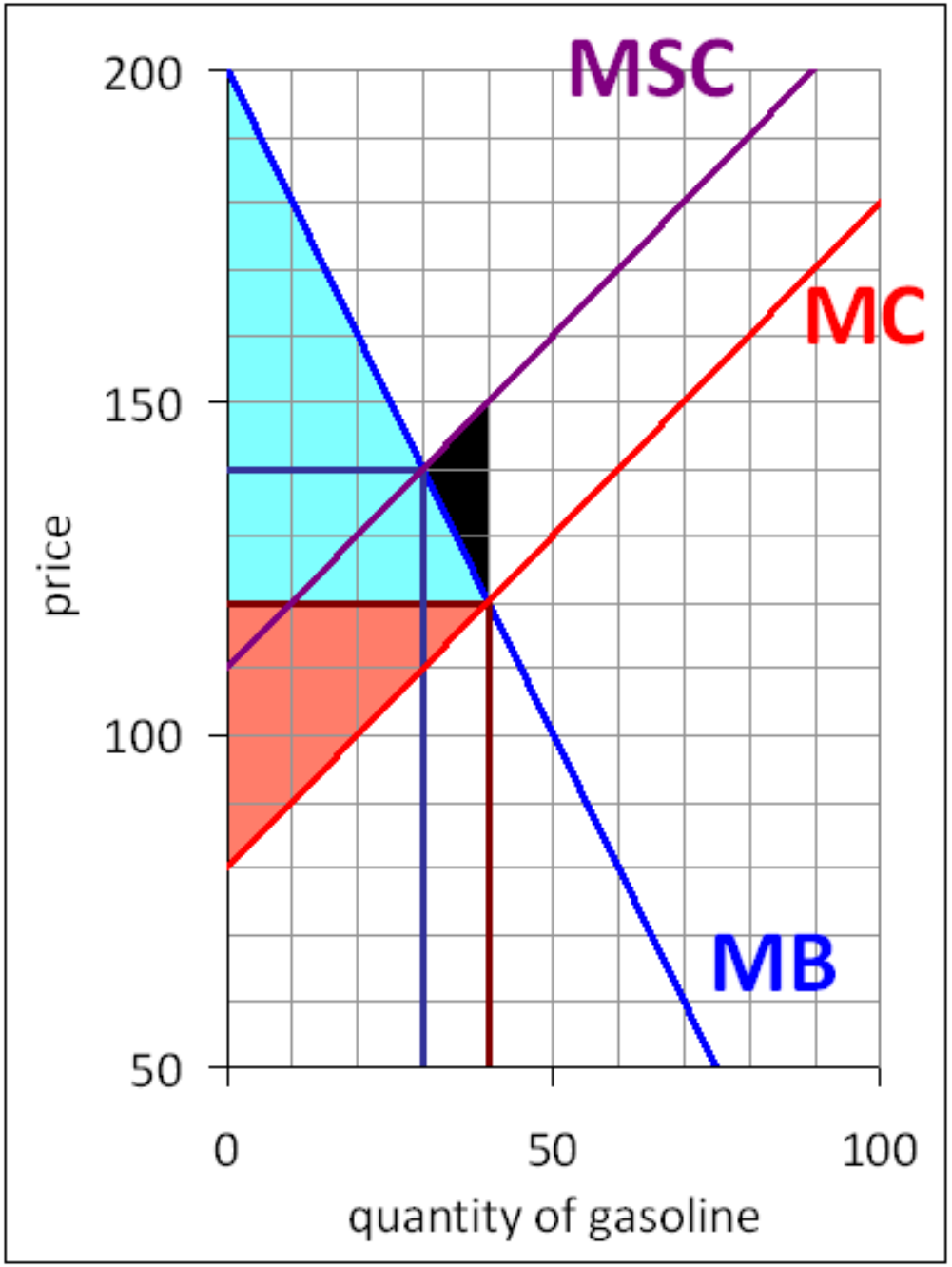
However, if we want to maximize the welfare of society as a whole, then we should stop producing oil before its marginal *social* costs exceed its marginal benefits.

MB = MSC

200 – 2Q = 110 + Q

3Q = 90, Q^{o} = 30 is the socially optimal quantity.

NEGATIVE EXTERNALITY: DEADWEIGHT LOSS



Q^o = 30 (social optimum)

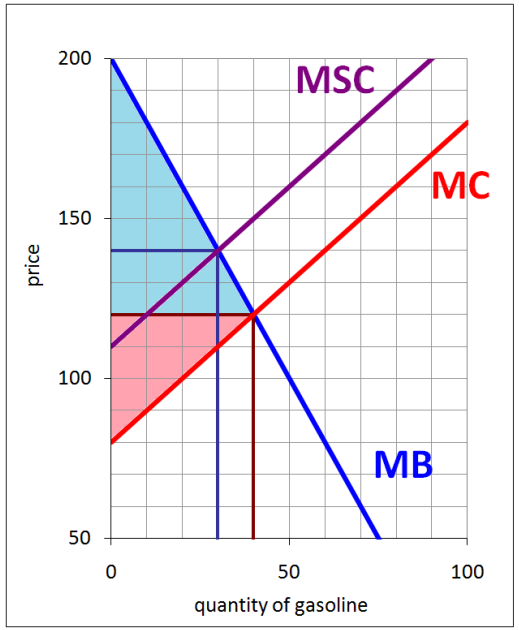
Q^* = 40 (market equilibrium)

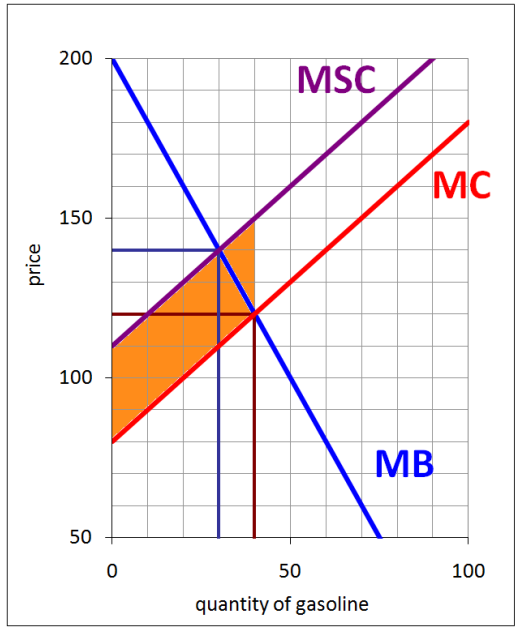
For every unit of gasoline consumed after Q^o = 30, the marginal social cost exceeds the marginal social benefit. Thus, the sum (or integral) of these differences forms the deadweight loss from not regulating gasoline pollution.

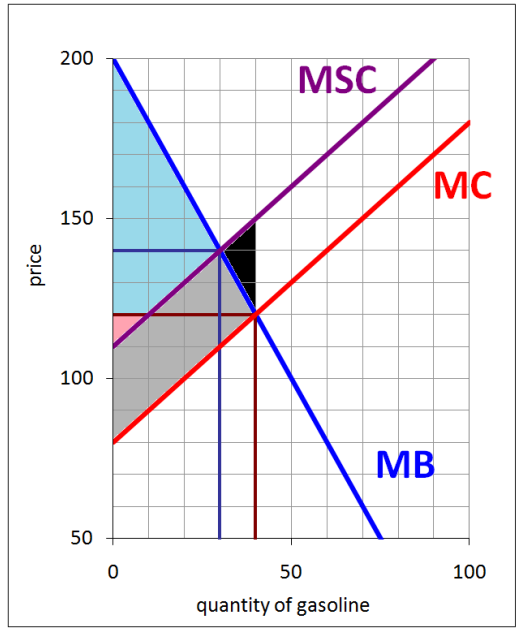
DWL = .5(30)(10) = 150

NEGATIVE EXTERNALITY: TOTAL SURPLUS

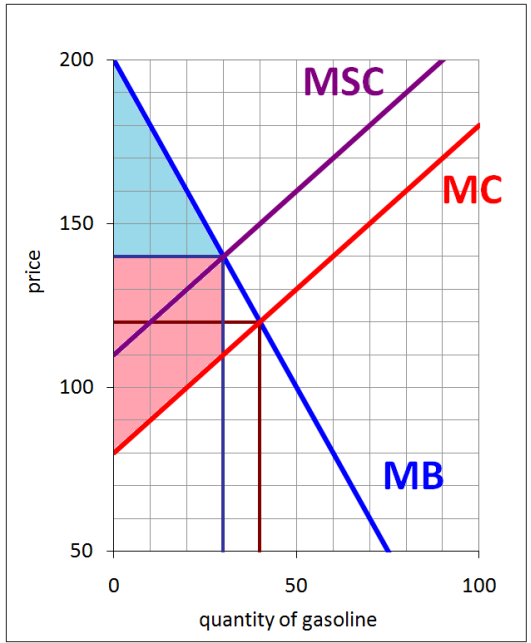
market equilibrium

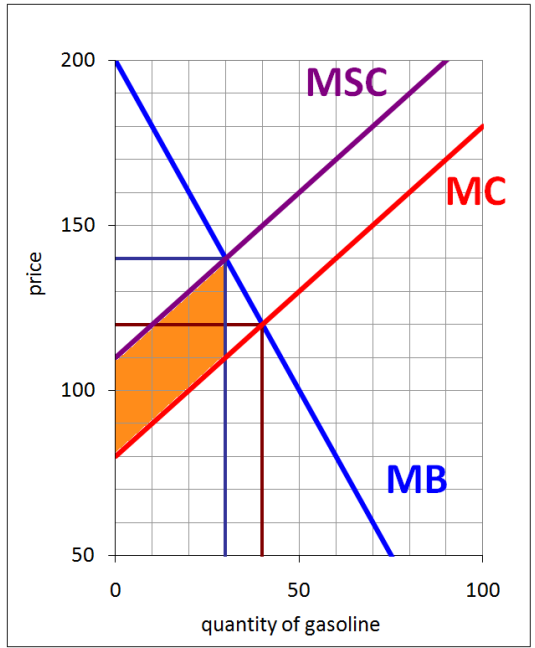


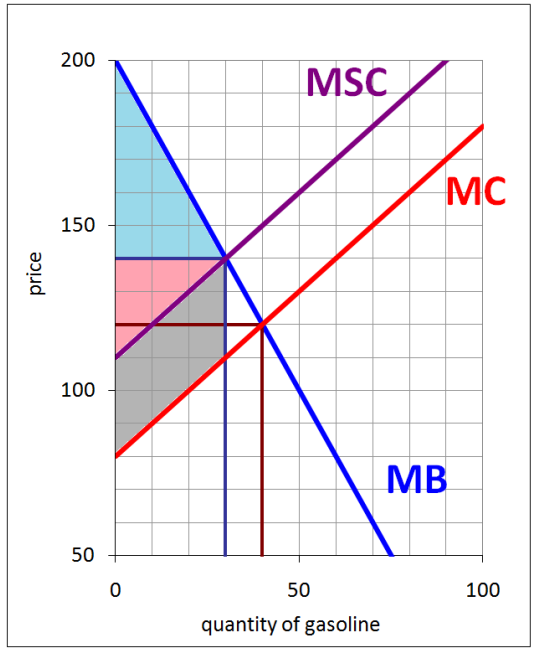




social optimum







QUESTION 1 (negative externality: market equilibrium)

marginal private benefit function: MB = 100 – 2Q

marginal private cost function: MC = 20 + 2Q

marginal external cost: MEC = 20

Once again, we have the market for gasoline, which produces a negative externality of $20 per unit. If neither buyers nor sellers of gasoline are required to pay for this external cost, then what is the quantity of gasoline produced and consumed in market equilibrium?

A) 60
B) 50
C) 40
D) 30
E) 20

answer to question 1

marginal private benefit function: MB = 100 – 2Q

marginal private cost function: MC = 20 + 2Q

marginal external cost: MEC = 20

Once again, we have the market for gasoline, which produces a negative externality of $20 per unit. If neither buyers nor sellers of gasoline are required to pay for this external cost, then what is the quantity of gasoline produced and consumed in market equilibrium?

A) 60
B) 50
C) 40
D) 30
E) 20

$$MB = MC \rightarrow 100 - 2Q = 20 + 2Q$$

$$\rightarrow 4Q = 80 \rightarrow Q = 20$$

QUESTION 2 (negative externality: social optimum)

marginal private benefit function: MB = 100 – 2Q

marginal private cost function: MC = 20 + 2Q

marginal external cost: MEC = 20

Okay, so the market equilibrium quantity of gasoline without any government intervention is 20, but what is the *socially optimal* quantity of gasoline?

A) 0
B) 5
C) 10
D) 15
E) 20

answer to question 2

marginal private benefit function: MB = 100 – 2Q

marginal private cost function: MC = 20 + 2Q

marginal external cost: MEC = 20

Okay, so the market equilibrium quantity of gasoline without any government intervention is 20, but what is the *socially optimal* quantity of gasoline?

A) 0
B) 5
C) 10
D) 15
E) 20

$$MSC = MC + MEC = 20 + 2Q + 20$$

$$MSC = 40 + 2Q$$

$$MB = MSC \rightarrow 100 - 2Q = 40 + 2Q$$

$$\rightarrow 4Q = 60 \rightarrow Q = 15$$

QUESTION 3 (negative externality: deadweight loss)

marginal private benefit function: MB = 100 – 2Q

marginal private cost function: MC = 20 + 2Q

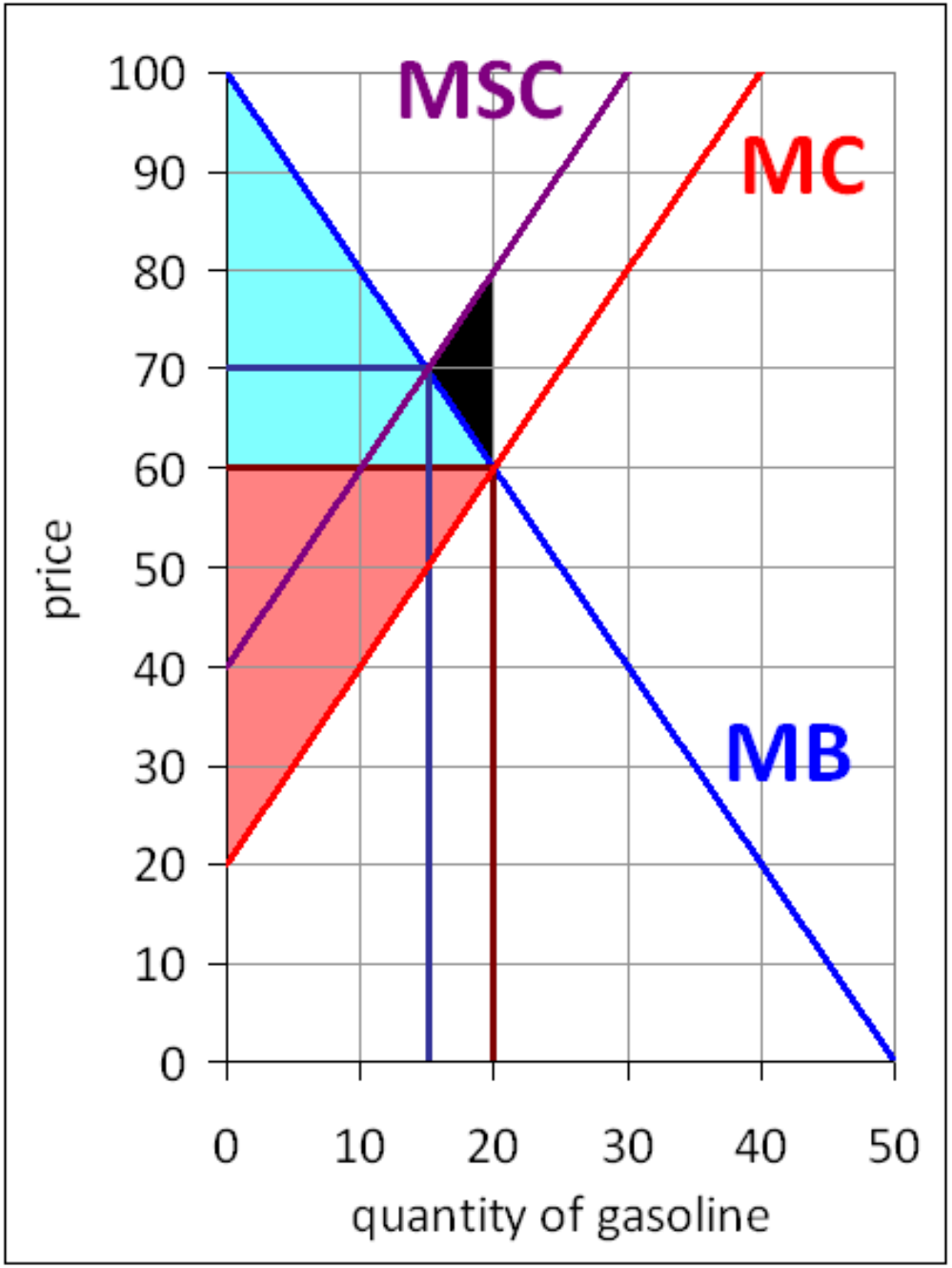
marginal external cost: MEC = 20

So, the market equilibrium quantity of gasoline is 20, and the socially optimal quantity is 15.

What is the deadweight loss associated with not regulating this market, and thus having a quantity of 20 instead of 15? (Or, how much surplus can be gained by switching from 20 to 15?)

A) 400
B) 50
C) 20
D) 120
E) 100

answer to question 3



MB = 100 – 2Q

MC = 20 + 2Q

MEC = 20

DWL = .5(20)(5) = 50

A) 400
B) 50
C) 20
D) 120
E) 100