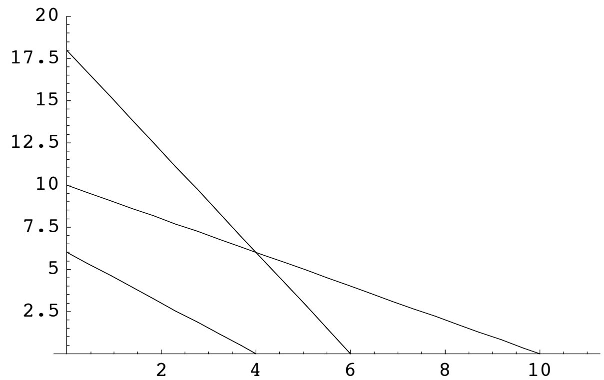
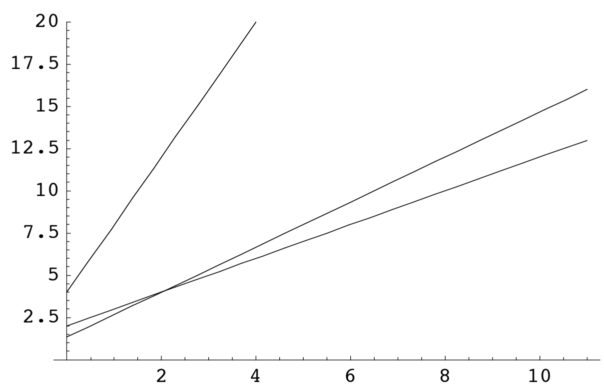
```
(*We start with two separate demand curves.  I'm plotting both on the same graph,
 since I don't know how to put them side by side in Mathematica!
  But notice something important--this graph should have a kink in it,
 something I glossed over in the handout.*)
c1 = 18 - 3 Q;
c2 = 6 - (3 / 2) Q;
dem = 10 - Q;
Plot[{c1, c2, dem}, {Q, 0, 11}, {AxesOrigin → {0, 0}}, PlotRange → {0, 20}]
```



Out[38]= - Graphics -

In[39]:=

```
(*Same idea with the supply curves:*)
s1 = 4 Q + 4;
s2 = (4 / 3) Q + (4 / 3);
sup = Q + 2;
Plot[{s1, s2, sup}, {Q, 0, 11}, {AxesOrigin → {0, 0}}, PlotRange → {0, 20}]
```



Out[42]= - Graphics -

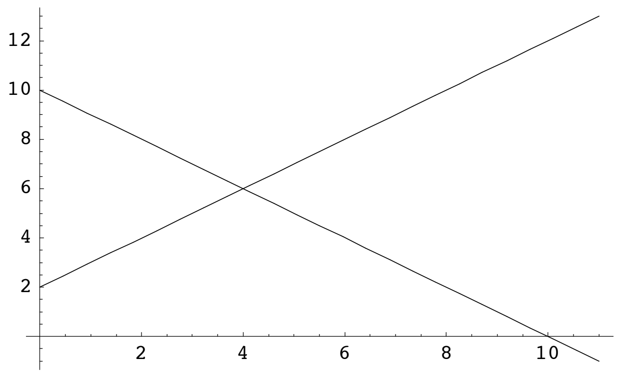
```
(*The free market equilibrium occurs where supply=demand.*)
dem = 10 - Q
sup =  Q + 2
fm = Solve[dem == sup, Q][[1]]
pfm = dem /. fm
Plot[{dem, sup}, {Q, 0, 11}, {AxesOrigin → {0, 0}}]
```

10 − Q

2 + Q

{Q → 4}

6




```
(*Since we are assuming no external costs,
 he free-market equilibrium is socially optimal,
 in that the net benefits (marginal benefit-marginal cost) from production of the good
  are maximized.  It also turns out that consumer and producer surplus are maximized,
 but we will not focus on this aspect in a quantitative way.  But do
  note that the marginal benefits are represented by the demand curve,
 and the marginal costs by the supply curve, as before.  Notice several things on
  the graphs:  marginal net benefits are zero at the point where supply equals demand;
 total net benefits are maximized at this point.*)

mnb = dem - sup
tnb = Integrate[mnb, Q]
Solve [tnb == 0, Q]
Plot[mnb, {Q, 0, 11}, {AxesOrigin → {0, 0}}]
Plot[tnb, {Q, 0, 11}, {AxesOrigin → {0, 0}}]
```

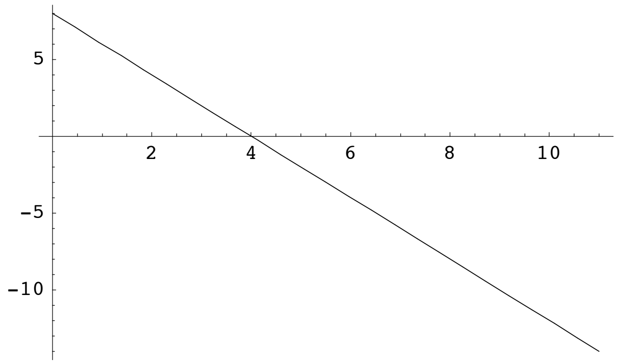
8 − 2 Q

marginal net benefit = 8 - 2 Q

$8\,Q - Q^2$

total net benefit = 8 Q - Q^2 (zero at 8)

{{Q → 0}, {Q → 8}}



**Notice also that when marginal benefits become negative,
total benefits are declining. Does this picture look familiar ?**