Assignment #12

HW # 12 2.3 p 174 # 4, 6, 18
2.4 p 185 # 48, 50

4.  a. Supply: \( p = q^2 + 8q + 22 \) (see below)
   b. Demand: \( p = 198 - 4q - \frac{1}{2}q^2 \) (see below)

   ![Graph of supply and demand curves]

   c. See E on the graph.
   d. Supply = Demand

\[
q^2 + 8q + 22 = 198 - 4q - \frac{1}{4}q^2
\]

\[
5q^2 + 48q - 704 = 0
\]

\[
(5q + 88)(q - 8) = 0
\]

\( q = 8 \) (only positive value)

When \( q = 8 \), \( p = (8)^2 + 8(8) + 22 \)
\( p = 150 \)

So, \( E = (8, 150) \).

6.  S: \( p = q^2 + 8q + 20 \)
D: \( 100 - 4q - q^2 = p \)

\[
q^2 + 8q + 20 = 100 - 4q - q^2
\]

\[
2q^2 + 12q - 80 = 0
\]

\[
2(q + 10)(q - 4) = 0
\]

\( q = 4 \) (only positive value)

When \( q = 4 \), \( p = 4^2 + 8(4) + 20 = \$68 \)

Equilibrium point: \( (4, 68) \)

18. At the break-even points, \( R(x) = C(x) \).

\[
1600x - x^2 = 1600 + 1500x
\]

\[
0 = x^2 - 100x + 1600
\]

\[
0 = (x - 20)(x - 80)
\]

\( x = 20 \) or \( x = 80 \) units
# 48 is tricky, because \( x \) is in hundreds of gallons, so if you have 3000 gallons, (as in part b) then \( x = 30 \)

48. \( f(x) = \begin{cases} 
38 & \text{if } 0 \leq x \leq 20 \\
38 + 0.4(x - 20) & \text{if } x > 20 
\end{cases} \)

a. \( f(0.3) = 38 \)

b. \( f(30) = 38 + 0.4(30 - 20) = 42 \)

c. \( f(40) = 38 + 0.4(40 - 20) = 46 \)

d. \[ y = \begin{cases} 
38 & \text{if } 0 \leq x \leq 20 \\
38 + 0.4(x - 20) & \text{if } x > 20 
\end{cases} \]

50. a. \( C(5) = 7.52 + 0.1079(5) = 8.06 \)

b. \( C(6) = 19.22 + 0.1079(6) = 19.87 \)

c. \( C(3000) = 131.345 + 0.0321(3000) = 227.65 \)