Name:__________________________________________

1. The marginal cost equation is $MC = 2q$. When $p = $30, $q^* = 15$, $\pi = $100. When $p = $20, $q^* = 15$, $\pi = -$25. The firm should keep operating since $TR > TVC$. The firm should shut down when $AVC > MC$ (normally, the minimum point of $AVC$). In this case, however, variable cost is linear with slope of 1, and $MC$ is linear with slope of 2, making all positive output levels above the shutdown point.

2. Set $MC = MR$ and solve.

\[
MC = 2q + 5 \\
MR = 35 \\
2q + 5 = 35 \\
q^* = 15, TR = 525, TC = 350, \pi = 175
\]

3. Set $p = MC$ gives $q^* = 3$. Thus $\pi = 6$.

4. See Figure 1. At $p_3$, the firm makes positive profits. At $p_2$, the firm breaks even and at $p_1$, the firm realizes losses that are less than fixed costs.

Figure 1
5. Surplus in Market 1 is $180, but only $160 in Market 2.

6. True or false, explain your answer. “Producer surplus and profits are always equal, since they mean the same thing.” This statement is true in the long run when there are no fixed costs, but false in the short run since $PS = R - VC$.

7. Perloff, Third edition, question 1 page 268
The shutdown rule states that a firm should shut down when it can avoid additional losses by doing so. This occurs when losses would exceed fixed costs. If the firm can cover any portion of fixed costs by continuing production, it should do so.

8. Perloff, Third edition, problem 18 page 310

$$CS = \frac{1}{2} \frac{a^2}{2b} = \frac{a^2}{8b}.$$