1. Luxray_a.

(a) 

\[ AC(y) = \frac{TC(y)}{y} = \frac{y^2 + 10}{y} = y + \frac{10}{y} \]

\[ AVC(y) = \frac{TVC(y)}{y} = \frac{y^2}{y} = y \]

\[ MC(y) = \frac{dTC(y)}{dy} = \frac{d}{dy}(y^2 + 10) = 2y \]

Luxray maximizes profits by producing output until \( MC(y) = p \), because up to that point each unit costs less than it sells for, and after that point each unit costs more than it sells for. In this case, \( MC(y) = p \) implies \( 2y = 100 \), or \( y^* = 50 \).

(b) 

\[ \Pi(50) = TR(50) - TC(50) = 5000 - (2500 + 10) = 2490 \]

\[ \Pi(50) = (p - AC(50))50 = (100 - 50.2)50 = 2490 \]

\[ \Pi(50) = (p - AVC(50))50 - F = (100 - 50)50 - 10 = 2490 \]

(c) We saw in part (b) that Luxray currently earns a super-normal profit. Since there is free entry into this market, firms will want to enter. This will shift market supply to the right, lowering price. As you can see from Luxray’s upward-sloping marginal cost curve, this will end up reducing the profit-maximizing level of output.
2. *OilProducers_a.*

(a) The average costs for the two types are:

\[
\begin{align*}
LAC_{SA}(y) &= y \\
LAC_{OS}(y) &= y + \frac{3000}{y}
\end{align*}
\]

Both types have \(LTVC(y) = y^2\) and hence \(LMC(y) = 2y\). Thus, at a price of 95 both types will produce \(y = 47.5\). Except that we need to check whether the oil shale wells can cover their fixed costs:

\[
LAC_{OS}(47.5) = 47.5 + \frac{3000}{47.5} = 110.65
\]

Since their average costs are greater than price, and we are in the long run, the oil shale wells will not enter the market.

(b) Both types of oil wells have \(LMC(y) = 2y\), so both have supply curves \(s(p) = \frac{p}{2}\). But oil shale wells only enter when the price is greater than their minimum average cost, found by setting

\[
LMC = LAC \Rightarrow 2y = y + \frac{3000}{y} \Rightarrow y = 54.8
\]

At this point, costs are \(LAC(54.8) = 54.8 + \frac{3000}{54.8} = 109.5\). Thus the medium run supply curve if there are \(N\) wells of each
type is

\[ S(p) = \begin{cases} 
Np \frac{p}{2} & p < 109.5 \\
2Np \frac{p}{2} & p \geq 109.5 
\end{cases} \]

(c) In the long run, things are similar to part (b) except now any number of oil shale wells will enter or leave the market at their minimum \( LAC \) of 109.5. Thus, long run supply is

\[ S(p) = \begin{cases} 
\frac{p}{2} & p < 109.5 \\
\infty & p \geq 109.5 
\end{cases} \]


(a) In the overall market we have a shift of demand causing higher prices. Stewart perceives this as an upward shift in their horizontal firm-level demand curve, and they move up their marginal cost curve to a new optimum.

(b) As we saw in (a), Stewart wants a higher quantity \( y' \). This means moving to a higher isoquant. It also means incurring higher costs, thus shifting to a higher isoquant. Since the price ratio of labor to steel is the same as before, the new isoquant must be parallel to the old one.

(a) \[
\frac{p - MC}{p} = \frac{1}{|c|} = -\frac{1}{1.2} = 83% 
\]

(b) First find the total cost curve:

\[y = \beta K^2 \Rightarrow K(y) = \beta^{-1/2} y^{1/2} \Rightarrow TC(y) = 20\beta^{-1/2} y^{1/2}\]

Then substitute the marginal cost into the Lerner index / elasticity formula:

\[\frac{p - 10\beta^{-1/2} y^{-1/2}}{p} = 0.83 \Rightarrow p - 10\beta^{-1/2} y^{-1/2} = 0.83p \Rightarrow \]

\[p = 58.8\beta^{-1/2} y^{-1/2}\]

From this it is clear that an increase in \(\beta\) holding \(y\) constant will decrease price. But we really need to count the effect of a change in \(\beta\) on \(y\). To do this, note that any constant elasticity demand curve will have the form \(y = AP^e\), so this one is \(y = Ap^{-1.2}\) (we don't know \(A\) which is fine) and we can sub this in to the formula above to get:

\[p = 58.8\beta^{-1/2} (Ap^{-1.2})^{-1/2} \Rightarrow p^{0.4} = 58.8\beta^{-1/2} A^{-1/2} \Rightarrow \]

\[p = (58.8)^{-2.5} \beta^{-1.25} A^{-1.25}\]

Now it is clear that \(p\) really does fall with \(\beta\).