Basic point/slope equations and forming economic models[1]
In-Class Problem[2]

Assume we have a labor market for engineers parameterized by two equations:

$$\boldsymbol{L_S = 12W - 120} \quad \textbf{(1)}$$

$$\boldsymbol{L_D = 60 - 3W} \quad \textbf{(2)}$$

Where W is monthly wages in \$1,000's and L is number of engineers.

- **a) Identify the market clearing levels of W and L**
- **b) Provide an appropriately formatted and completely labeled graph for this market**
- **c) Complete a table of values Labor Supply and Demand given a set of values for wage**
- **d) Identify what might occur if wages were to be constrained to \$6,000 per month**
- **e) Identify the own wage elasticity of demand as the wage changes from the market clearing level to \$6,000 per month**

a) Identify the market clearing levels of W* and L*

$$L_S = L_D \quad (3)$$

$$12W - 120 = 60 - 3W$$

$$15W = 180$$

$$W^* = 12 \; or \; \$12{,}000 \; per \; month$$

Substitute (4) into (2) (4)

$$L_D = 60 - 3(12)$$

$$L^* = 24 \quad (5)$$

[1] This In-Class Problem is intended to present an abbreviated discussion of the included economic concepts and is not intended to be a full or complete representation of them or the underlying economic foundations from which they are built.
[2] This problem was developed by Richard Haskell, PhD (rhaskell@westminstercollege.edu), Associate Professor of Finance, Bill & Vieve Gore School of Business, Westminster College, City, Utah (2017).

b) Provide an appropriately formatted and completely labeled graph for this market

For labor supply ($L_S = 12W - 120$)

When $W = 0, L_S = 12(0) - 120$ or $L_S = -120$

When $L_S = 0, 0 = 12W - 120$

$120 = 12W$ or $W = 10$

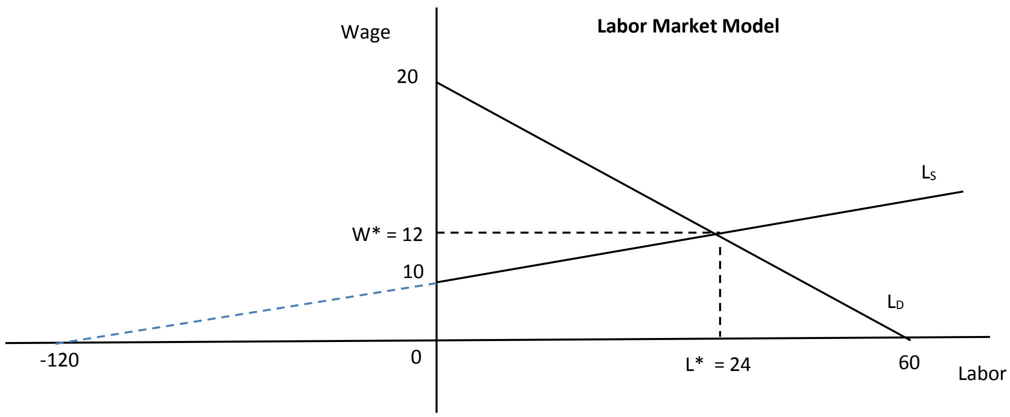
For labor demand ($L_D = 60 - 3W$)

When $W = 0, L_D = 60 - 3(0)$ or $L_D = 60$

When $L_S = 0, 0 = 60 - 3W,$

$3W = 60$ or $W = 20$

Graph



c) Complete a table of values Labor Supply and Demand given a set of values for wage

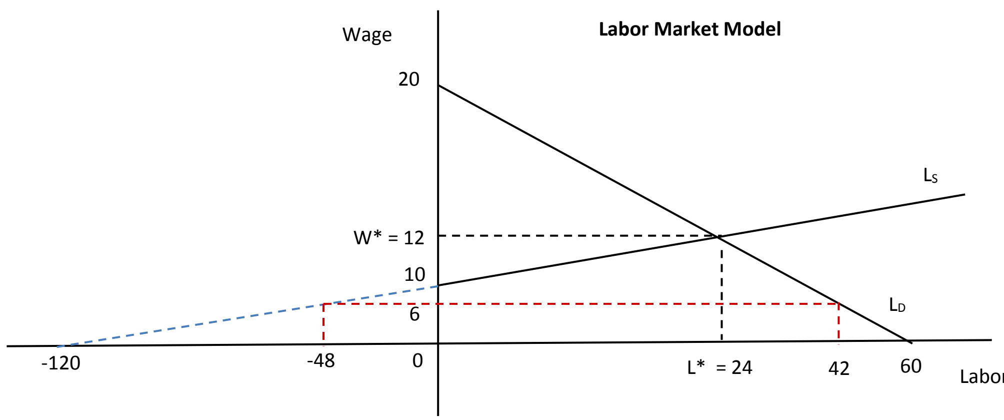
W	$L_S = 12W - 120$	$L_D = 60 - 3W$
4	-72	48
5	-60	45
6	-48	42
7	-36	39
8	-24	36
9	-12	33
10	0	30
11	12	27
12	24	24
13	36	21
14	48	18
15	60	15
16	72	12
17	84	9

d) Identify what might occur if wages were to be constrained to $6,000 per month – include the values you might expect to see, the condition resulting from these values, and a graphic model telling the story.

$$L_S = 12W - 120 = 12(6) - 120 = -48 \quad (6)$$

$$L_D = 60 - 3(6) = 42 \quad (7)$$

$L_D > L_S$ -- what does this mean to us in this case? It would suggest that at a wage of $6,000 a month (half of the market clearing wage) producers wants to hire 42 engineers, up from 24, but there aren't any engineers willing to work for that wage. Interesting… this says something about the reservation wage of an engineer and might suggest something of the cost of becoming an engineer. The graph will look something like this:



e) Identify the own wage elasticity of demand as the wage changes from the market clearing level to $6,000 per month

$$\eta = \frac{\%\,\Delta\, L}{\%\,\Delta\, W} = \frac{\frac{L_2 - L_1}{L_1}}{\frac{W_2 - W_1}{W_1}} \quad (8)$$

We already know that $W_1 = 12, L_1 = 24$ and we're given $W_2 = 6$, so we need to find L_2 via the L_D equation, which we already calculated in part d):

$$L_D = 60 - 3(6) = 42 = L_2$$

$$\eta = \frac{\%\,\Delta\, L}{\%\,\Delta\, W} = \frac{\frac{42-24}{24}}{\frac{6-12}{12}} = \frac{\frac{18}{24}}{-\frac{6}{12}} = \left(\frac{18}{24}\right)\left(-\frac{12}{6}\right) = -\frac{216}{144} = -1.5 > |-1|$$

So, we see that this own wage elasticity of demand is ***elastic***, but not hugely so (it is relatively inelastic compared to elasticities of -2, -3, -4, etc), which doesn't really surprise us given that engineers are highly skilled and not easily substituted by other forms of labor.