1. Suppose Jeremy currently resides in Philadelphia, PA, and is deciding whether to remain there or to move to San Francisco, CA. There are three work periods left in his life cycle. If he remains in Philadelphia, he will earn $20,000 in each of the three periods. If he moves to San Francisco, he will earn $22,000 per period.

(a) Given that Jeremy's discount rate is 10%, what is the highest level of migration costs he would be willing to incur and still move to San Francisco?

(b) Suppose he has a third option: Move to Houston, TX, and earn $21,000 in each period. The distance between Philadelphia and Houston is 1,545 miles, and the distance between Philadelphia and San Francisco is 2,915 miles. Suppose migration costs are determined by distance only, and that each mile causes migration costs of $1.80. What will Jeremy do, and why?

(c) If Jeremy moved to San Francisco now, but back to Philadelphia after the first period: What is this behavior called? On the other hand, if he moved to San Francisco now, and then on to Houston in the next period, how would we refer to this behavior? Are these two phenomena consistent with the model of maximization of present value of lifetime earnings, and why (not)?

2. Suppose that a worker's skills can be summarized by the number of efficiency units of human capital she owns, and that the distribution of efficiency units in the population is such that worker 1 has 1 efficiency unit, worker 2 has 2 efficiency units, and so on. Moreover, suppose there are 100 workers in the population of Wombasia. In deciding whether to migrate to the US, Wombasians compare their earnings at home (w_0) with their potential earnings in the US (w_1). The wage-skill relationship in the two countries is given by:

\[
S \leq 700 + 0.5S \\
S \geq 670 + S
\]

where S gives the number of efficiency units a worker has acquired. Assume that skills are completely transferable across countries, and that there are no migration costs.

(a) Give a definition of "positive selection" and "negative selection" in migration flows.

(b) Is the migration flow from Wombasia to the US positively or negatively selected? Why? Support your argument with a graph. Is this consistent with the hypothesis of a "brain drain" from Wombasia to the US, and why (not)?

(c) What is the average number of efficiency units among immigrants from Wombasia to the US?

3. Economists have studied many different reasons why discrimination might arise in the labor market: race, sex, physical handicaps, even linguistic differences. Now suppose you are a researcher and you want to investigate whether "attractiveness" or "looks" might also be a cause of discrimination in the labor market. Specifically, you are interested in whether being "good-looking" is associated with higher earnings, and whether being "not-so-good-looking" on the other hand may result in a wage penalty.
(a) In order to undertake this research, why do you need an objective measure of "beauty"? What has previous research shown regarding the existence of such "standards of beauty"? Describe how a repeated survey in which different interviewers (at each stage) rate the respondents' looks can provide such an objective measure.

(b) Suppose you have obtained a data set in which the variable "beauty" takes on three values: (i) above average (good looking), (ii) average, (iii) below average (quite plain). You estimate a regression of the type

$$\log(w) = \beta_{\text{above}} A + \beta_{\text{below}} B + \text{control variables}$$

i.e. you try to explain differences in wages (w) by differences in beauty, controlling for a set of variables that potentially play a role in explaining wage differentials, such as age, education, marital status, industry, etc. "A" is an indicator variable taking on the value "1" if a person has above-average looks, and "0" otherwise, and B is an indicator variable taking on the value "1" if a person has below-average looks, and "0" otherwise. Therefore, the coefficients $\beta_{\text{above}}$ and $\beta_{\text{below}}$ give you the percent wage premium and penalty, respectively, that are associated with having above average or below average looks.

Suppose these are the estimation results of your research:

<table>
<thead>
<tr>
<th></th>
<th>$\beta_{\text{below}}$</th>
<th>$\beta_{\text{above}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>-0.09 (0.03)</td>
<td>0.06 (0.02)</td>
</tr>
<tr>
<td>Women</td>
<td>-0.05 (0.04)</td>
<td>0.04 (0.02)</td>
</tr>
</tbody>
</table>

Note: Standard errors in parentheses.

Give an interpretation of these results. Specifically, address the following issues: Do the results suggest that wage premiums and penalties for good and bad looks exist? Are there differences in premiums/penalties between men and women? How large are the respective premiums/penalties for men and women in percentage points? Do the results, therefore, suggest that there is discrimination because of looks in the labor market?

[Recall that the absolute value of an estimate has to be twice as large as its standard error in order to be significant, i.e. statistically meaningful]

4. Suppose that schooling S is the only variable that affects earnings, and that the equations giving the wages of male and female workers are given by:

$$w_M = 500 + 100S$$
$$w_F = 300 + 75S$$

On average, men have 14 years of schooling, and women have 12 years of schooling.

(a) What is the "raw" male-female wage differential in the labor market?

(b) Using the Oaxaca decomposition, calculate how much of this raw wage differential is due to skills, and how much is due to discrimination. Illustrate your solution in a graph, indicating how we can see the decomposition in the graph.