1. Write down four properties of isoquants and articulate their substantive importance.

2. Consider a school that uses two inputs to produce student achievement: teachers and books. Use a graph to illustrate an inefficient input bundle where the school is using too many books and not enough teachers. Starting at the inefficient bundle, show on the graph how the school can generate more achievement with the same budget by changing the composition of inputs.

3. Imagine a school that uses teachers and aides to produce student achievement. The price of a teacher is \(P_T\) and the price of an aide is \(P_A\). Draw a budget constraint for the school at an initial price ratio with total budget \(C\). Now, draw a new budget constraint if the price of teachers doubles, the price of aides is unchanged, and \(C\) is unchanged.

4. The school in question 3 faces the production function for student learning:

\[ L = T^{2/3} A^{1/4} \]

Before the price increase for teachers, \(P_T = 20\) and \(P_A = 10\). With a budget of 140, how many teachers and how many aides would maximize student achievement subject to the budget constraint (partial units can be purchased). Graph your answer.

After the price increase for teachers we have \(P_T = 40\) and \(P_A = 10\). Now how many teachers and how many aides are used (partial units can be purchased)?

5. A school down the street faces a different production function and a different labor market. The production function is:

\[ L = T^{1/2} A^{3/8} \]

The prices for teachers and aides are \(P_T = 15\) and \(P_A = 12\), respectively. With a budget of 100, how many teachers and how many aides does this other school use (partial units can be purchased)?

Consider a political constraint mandating that at least 4 teachers must be hired. What is the cost of this constraint in terms of output?

Graph your answer.
6. Returning to the school in question 4, facing the newer price profile \( (P_T = 40 \text{ and } P_A = 10) \), how many teachers and aides would be hired if the budget doubled from 140 to 280?

7. You are on the school board for a district with just one school that faces the following production function for student learning, which you know to be accurate:

\[
L = 2T^{3/4}B^{1/4}
\]

In the equation, \( L \) is learning, \( T \) is the number of teachers and \( B \) is the number of books, with \( P_T = 12 \) and \( P_B = 2 \). The school has a budget of 32.

However, the school principal thinks that the production function looks like this instead, and is operating as such:

\[
L = 2T^{2/3}B^{1/3}
\]

Given your true knowledge of the problem, find and graph the learning-maximizing bundle of teachers and books for the school, as well as the operating bundle (based on what you know about the problem the principal is solving). Try to predict where the operating bundle will be located on the graph relative to the output-maximizing bundle before doing any math, based on what you know about the principal’s misconception.

Use your knowledge of the problem to suggest a constraint on inputs that will force the school principal to use a more efficient bundle even if she continues to misunderstand the production function.

8. Two school districts operate in the same market and use inputs \( F \) and \( G \) to produce student achievement efficiently. District A has the production function \( Q_A = R*(F^rG^y) \), where \( R \) is a constant, and school district B has the production function \( Q_B = S*(F^rG^y) \), where \( S \) is a constant. If \( S > R \), what is the most you can say about how the marginal rate of technical substitution (MRTS) for District A compares to the marginal rate of technical substitution for District B?