Instructions:
Answer all of the following questions. You have the class period to complete the exam.

Answer each question clearly and concisely. You must show your work to receive credit.

This exam is given under the rules of the Montana State University. By printing your name above you acknowledge the University’s Honor Code and agree to comply with the provisions of the Honor Code. You may not use notes or receive any assistance. There is to be no talking during the exam. You may use a calculator, but are never allowed to use device allowing you to take photographs or transmit over a network. No notes, no assistance, no talking, no cell phones, but you can use a calculator.

Clearly print your name above, in the space provided on the next page and in your blue book(s). You must turn in the exam and your blue book(s). There are two versions of the exam. Indicate your exam version on your blue book. It is your responsibility to make sure your version of the exam is different from the students next to you. If you have the same version as any of the students next to you, you will be asked to move.
True/False/Uncertain Plus Explanation

1. For each of the following, state whether it is true, false or uncertain and explain your answer. No points are given without explanation.

(a) You should stop studying for your economics exam once you reach the point of diminishing returns.

(b) If inputs into production cannot be substituted for each other but have to be employed in fixed-proportions isoquants are straight, downward-sloping lines.

(c) The minimum point of a short-run average cost curve will be on the long-run average cost curve.

(d) If the government wishes to increase the utility of consumers by a specific amount, it is less expensive to do that through a cash gift than through a price subsidy on a commonly purchased good (such as food).

Short Answer/Numerical

2. A consumer has the following utility function.

\[ U(x, y) = x^{\frac{1}{2}} y^{\frac{1}{2}} \]

(a) Find the general demand functions for \( x \) and \( y \) which are described as \( x^* = x(p_x, p_y, m) \) and \( y^* = y(p_x, p_y, m) \).

(b) The consumers current income is \( m = 100 \) and current prices are \( p_x = 1, p_y = 1 \). What happens to the optimal bundles when \( p_x \) decreases to \( p'_x = \frac{1}{4} \)?

(c) What is the total effect of the change in \( p_x \) on \( x^* \)?

(d) How much income do you have to take away from the consumer to compensate them for the price change? (Hint: Use the new prices with the old utility level to find the change in income.)

(e) Decompose the total effect reported in part c into a substitution effect and an income effect.
3. In many countries it is not uncommon for children to work instead of attending school. Working provides income for the family and sending children to school costs $10 per week. Governments and families realize that it’s much better for children to go to school, but families are income constrained and the average annual income per family is $100. The annual demand for schooling is

\[ q = 10mp^{-2} \]

where \( q \) is the number of weeks per year of schooling desired.

(a) What’s the price elasticity of demand for schooling?

(b) If the government subsidizes the cost per week of schooling so that children are sent to school for 40 weeks out of the year, what’s the weekly subsidy?

(c) How much does this subsidy cost the government per year per family?

(d) Would it be cheaper to setup government run schools and provide 40 weeks of schooling per year for free? Assume that the government is not more efficient than the market.

4. A firm has the following production function

\[ q = K^{\frac{1}{2}}L^{\frac{1}{2}}. \]

The wage rate and the rental rate of capital are both equal to $1. The firm would like to know the minimum cost of producing 1,000 units of output.

(a) Find the combination of inputs that minimizes the cost of producing 1,000 units.

(b) What is the minimum cost of producing 1,000 units?

(c) Now the firm wants to know how much output it can produce for a cost of $5,000. Find the output-maximizing input combination and the maximum output that can be produced.

(d) The firm decides to purchase 1,000 units of capital. What are the firm’s short run and long run cost curves?