

### EXAMINATION #1 ANSWER KEY

#### Version A

##### I. MULTIPLE CHOICE:

- (1)d. (2)e. (3)a. (4)e. (5)c. (6)a. (7)c. (8)d. (9)d. (10)b. (11)a.

##### II. SHORT ANSWER:

- |     |             |              |               |         |
|-----|-------------|--------------|---------------|---------|
| (1) | a. decrease | b. 1.5 units | c. increase   | d. 6 %. |
| (2) | a. increase | b. 0.8 units | c. decrease   | d. 1 %. |
| (3) | a. down     | b. decrease  | c. 2.5 units. |         |
| (4) | a. decrease | b. 3 %.      |               |         |
| (5) | a. decrease | b. 2 %.      |               |         |

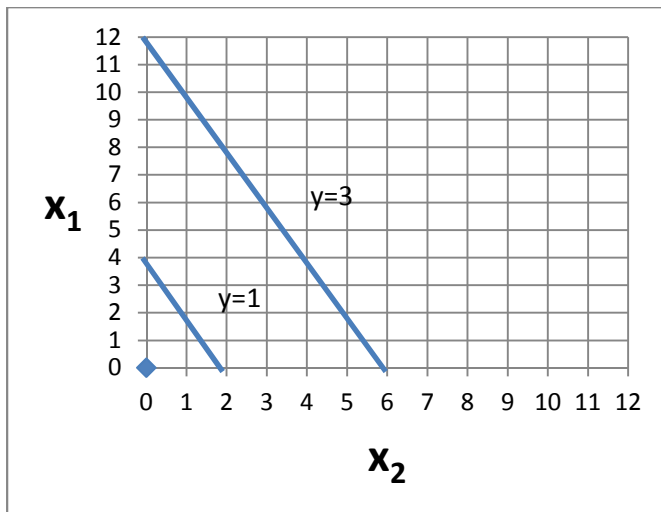
##### III. PROBLEMS:

Please write your answers in the boxes on this question sheet. Show your work and circle your final answers.

(1) a.  $\frac{dy}{dx} = \frac{6}{x} - 2$ .                                 b.  $x^* = 3$ .

(2) a.  $\epsilon_1 = \frac{3x_1}{x_1-5}$ .                                        b.  $\epsilon_2 = 2$ .

(3) a. MRS = 2.    b.



(4) a.  $MRS = \frac{3x_1^3}{5x_2^3}$ .

b. Any monotonic transformation of  $f(x_1, x_2)$  gives a different function  $g(x_1, x_2)$  that has exactly the same formula for the marginal rate of substitution, including

$$g(x_1, x_2) = \left(-\frac{5}{x_1^2} - \frac{3}{x_1^2}\right)^2,$$
$$g(x_1, x_2) = \left(-\frac{5}{x_1^2} - \frac{3}{x_1^2}\right) + 2,$$
$$g(x_1, x_2) = 5\left(-\frac{5}{x_1^2} - \frac{3}{x_1^2}\right).$$

**IV. CRITICAL THINKING:**

(1) The slope of the level curves  $= -\frac{\partial y/\partial x_2}{\partial y/\partial x_1} = 0$ . So the level curves must be *horizontal lines*.

**Version B**

**I. MULTIPLE CHOICE:**

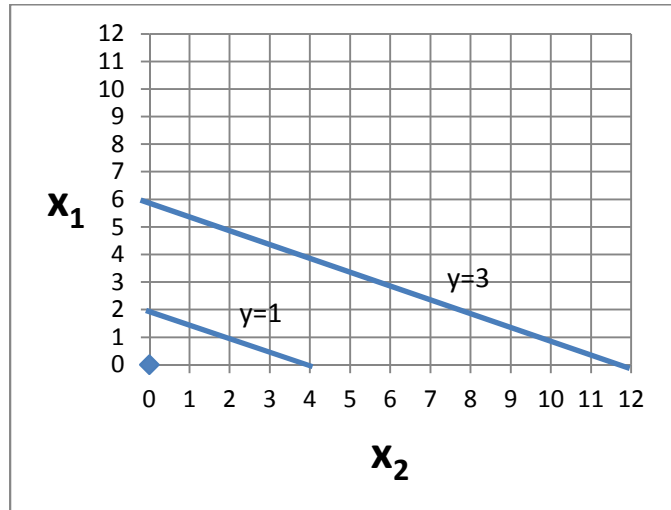
(1)e. (2)f. (3)c. (4)d. (5)a. (6)c. (7)a. (8)f. (9)a. (10)c. (11)c.

**II. SHORT ANSWER:**

- (1) a. decrease    b. 2 units    c. increase    d. 3 %.  
(2) a. increase    b. 1.2 units    c. decrease    d. 1 %.  
(3) a. down    b. decrease    c. 2 units.  
(4) a. increase    b. 1 %.  
(5) a. decrease    b. 4 %.

**III. PROBLEMS:** Please write your answers in the boxes on this question sheet. Show your work and circle your final answers.

- (1) a.  $\frac{dy}{dx} = \frac{9}{2}x^{-1/2} - \frac{1}{2}$ .    b.  $x^* = 81$ .
- (2) a.  $\varepsilon_1 = 3$ .    b.  $\varepsilon_2 = \frac{2x_2}{x_2 - 4}$ .
- (3) a. MRS = 1/2.    b.



(4) a.  $MRS = \frac{3x_1^{1/2}}{2x_2^{1/2}}$ .

b. Any monotonic transformation of  $f(x_1, x_2)$  gives a different function  $g(x_1, x_2)$  that has exactly the same formula for the marginal rate of substitution, including

$$g(x_1, x_2) = (4x_1^{1/2} + 6x_2^{1/2})^2,$$

$$g(x_1, x_2) = (4x_1^{1/2} + 6x_2^{1/2}) + 2,$$

$$g(x_1, x_2) = 5 \left( 4x_1^{\frac{1}{2}} + 6x_2^{\frac{1}{2}} \right),$$

$$g(x_1, x_2) = \ln \left( 4x_1^{\frac{1}{2}} + 6x_2^{\frac{1}{2}} \right).$$

**IV. CRITICAL THINKING:**

(1) The slope of the level curves  $= -\frac{\partial y / \partial x_2}{\partial y / \partial x_1} = -\frac{\partial y / \partial x_2}{0} = \infty$ . So the level curves must be *vertical lines*.

**Version C**

**I. MULTIPLE CHOICE:**

(1)d. (2)c. (3)c. (4)b. (5)b. (6)e. (7)b. (8)f. (9)d. (10)a. (11)c.

**II. SHORT ANSWER:**

- (1) a. increase    b. 1 unit    c. decrease    d. 4 %.
- (2) a. decrease    b. 0.5 unit    c. increase    d. 2 %.
- (3) a. down    b. decrease    c. 3/4 units.
- (4) a. increase    b. 2 %.
- (5) a. increase    b. 3 %.

**III. PROBLEMS:** Please write your answers in the boxes on this question sheet. Show your work and circle your final answers.

(1) a.  $\frac{dy}{dx} = 3x^{1/2} - 15$  .

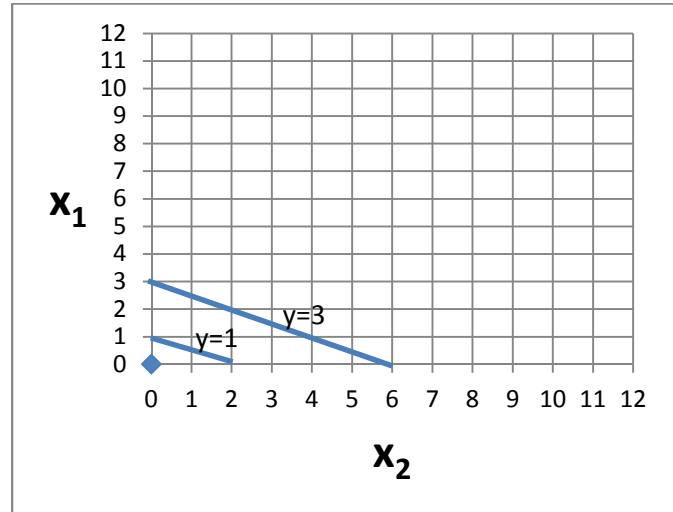
b.  $x^* = 25$  .

(2) a.  $\epsilon_1 = 2$  .

b.  $\epsilon_2 = \frac{5x_2}{x_2+3}$  .

(3) a.  $MRS = 1/2$ .

b.



(4) a.  $MRS = \frac{2x_1^2}{x_2^2}$  .

b. Any monotonic transformation of  $f(x_1, x_2)$  gives a different function  $g(x_1, x_2)$  that has exactly the same formula for the marginal rate of substitution, including

$$g(x_1, x_2) = \left(-\frac{2}{x_1} - \frac{4}{x_2}\right)^2 ,$$

$$g(x_1, x_2) = \left(-\frac{2}{x_1} - \frac{4}{x_2}\right) + 2 ,$$

$$g(x_1, x_2) = 5 \left(-\frac{2}{x_1} - \frac{4}{x_2}\right) .$$

**IV. CRITICAL THINKING:**

(1) The slope of the level curves  $= -\frac{\partial y/\partial x_2}{\partial y/\partial x_1} = -\frac{\partial y/\partial x_1}{\partial y/\partial x_1} = -1$  . So the level curves must be *downward-sloping straight lines with slope = -1*.

[end of answer key]