ECON 173 - Intermediate Microeconomic Analysis
Drake University, Fall 2016
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EXAMINATION #1 ANSWER KEY
"Mathematical Tools"

Version A

I. Multiple choice

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

II. Short answer

(1) a. increase b. 5 units, using derivative since change is given in units.
(2) a. increase b. 4 %, using elasticities since changes are given in percent.
(3) a. decrease b. 1 %, using approximation rule for products.
(4) a. increase b. 6 %, using approximation rule for ratios.
(5) a. increase b. 12 units c. decrease d. 4 units.
(6) a. down b. -2.5. = $\frac{\partial y/\partial x_2}{\partial y/\partial x_1}$.

III. Problems

(1) a. dy/dx = -2x+6. b. x* = 3.
c. Slopes up for x<3 because dy/dx is positive.
Slopes down for x>3 because dy/dx is negative.
d. y* = f(x*) = f(3) = 4.

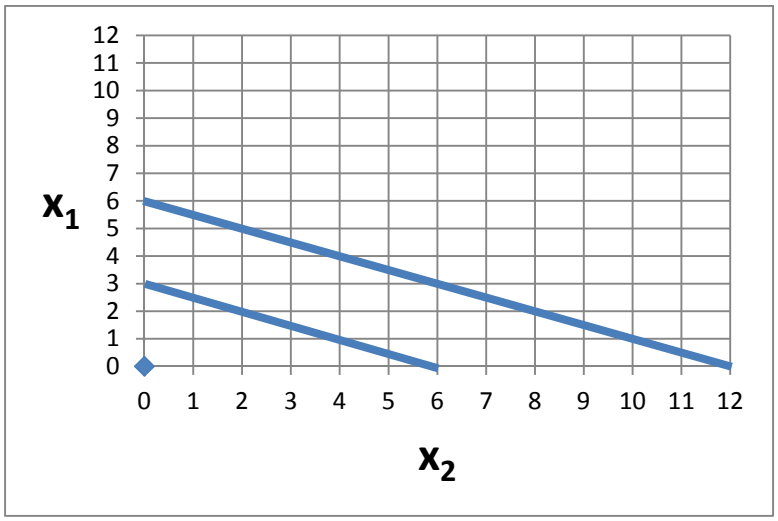
(2) a. $\varepsilon_1 = \frac{2x_1}{x_1 - 5}$. b. $\varepsilon_2 = 3$.

(3) a. $\frac{\partial y}{\partial x_1} = 2\, x_1^{-0.5}$ b. $\frac{\partial y}{\partial x_2} = x_2^{-0.5}$ c. $MRS = \frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{x_1^{0.5}}{2\, x_2^{0.5}}$.

(4) a. $\frac{\partial y}{\partial x_1} = 2(x_1 - 3)(x_2 + 4)^3$ b. $\frac{\partial y}{\partial x_2} = (x_1 - 3)^2 3(x_2 + 4)^2$
c. $MRS = \frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{3(x_1 - 3)}{2(x_2 + 4)}$.

IV. Critical thinking

(1) Slope of level curves = $-\frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{-1}{2}$. Level curves are therefore straight lines with slope = -1/2. Examples:



Version B

I. Multiple choice

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

II. Short answer

(1) a. increase b. 2 %, using elasticity since change is given in percent.
(2) a. increase b. 17 units, using derivative since changes are given in units.
(3) a. decrease b. 3 %, using approximation rule for products.
(4) a. decrease b. 3 %, using approximation rule for ratios.
(5) a. increase b. 204 units c. decrease d. 16 units.
(6) a. down b. -0.5.

III. Problems

(1) a. dy/dx = -2x+8. b. x* = 4.
c. Slopes up for x<4 because dy/dx is positive.
Slopes down for x>4 because dy/dx is negative.
d. y* = f(x*) = f(4) = 26.

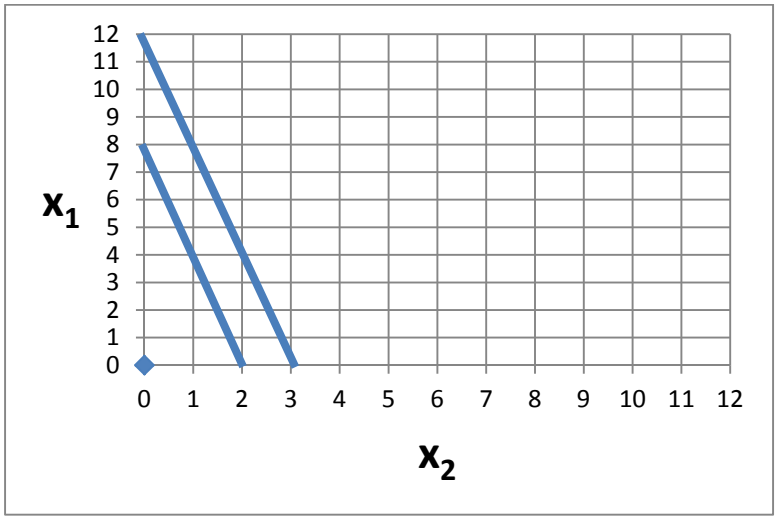
(2) a. $\varepsilon_1 = 3$. b. $\varepsilon_2 = \frac{4x_2}{x_2+2}$

(3) a. $\frac{\partial y}{\partial x_1} = 3\,x_1^{-1.5}$ b. $\frac{\partial y}{\partial x_2} = 2\,x_2^{-1.5}$ c. $MRS = \frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{2}{3}\left(\frac{x_1}{x_2}\right)^{1.5}$.

(4) a. $\frac{\partial y}{\partial x_1} = 3(x_1+4)^2(x_2-5)^2$ b. $\frac{\partial y}{\partial x_2} = (x_1+4)^3\,2\,(x_2-5)$
c. $MRS = \frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{2(x_1+4)}{3(x_2-5)}$.

IV. Critical thinking

1) Slope of level curves = $-\frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{-1}{2}$. Level curves are therefore straight lines with slope = -2. Examples:



Version C

I. Multiple choice

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

II. Short answer

(1) a. increase b. 2 units, using derivative since change is given in units.
(2) a. increase b. 4 %, using elasticities since changes are given in percent.
(3) a. increase b. 3 %, using approximation rule for products.
(4) a. increase b. 5 %, using approximation rule for ratios.
(5) a. increase b. 20 units c. decrease d. 10 units.
(6) a. down b. -3. = $\frac{\partial y/\partial x_2}{\partial y/\partial x_1}$.

III. Problems

(1) a. dy/dx = -2x+10. b. x* = 5.
c. Slopes up for x<5 because dy/dx is positive.
Slopes down for x>5 because dy/dx is negative.
d. y* = f(x*) = f(5) = 10.

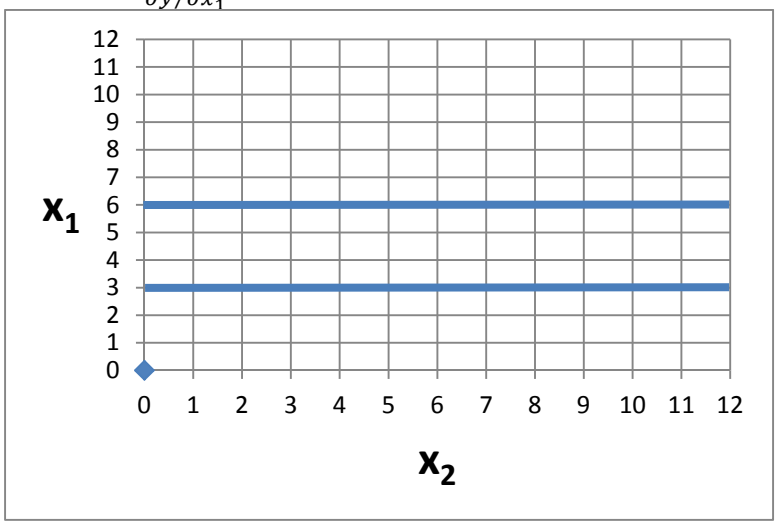
(2) a. $\varepsilon_1 = \frac{2x_1}{x_1+4}$. b. $\varepsilon_2 = 4$.

(3) a. $\frac{\partial y}{\partial x_1} = 3\,x_1^{-2}$ b. $\frac{\partial y}{\partial x_2} = 2\,x_2^{-2}$ c. $MRS = \frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{2\,x_1^2}{3\,x_2^2}$.

(4) a. $\frac{\partial y}{\partial x_1} = 3\,(x_1+5)^2\,(x_2-6)^2$ b. $\frac{\partial y}{\partial x_2} = (x_1+5)^3\,2\,(x_2-6)$
c. $MRS = \frac{\partial y/\partial x_2}{\partial y/\partial x_1} = \frac{2(x_1+5)}{3(x_2-6)}$.

IV. Critical thinking

(1) Slope of level curves = $-\frac{\partial y/\partial x_2}{\partial y/\partial x_1} = 0$. Level curves are therefore horizontal lines. Examples:



[end of answer key]