DEPARTMENT OF ECONOMICS
FACULTY OF SOCIAL SCIENCES
OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA
SSC106: MATHEMATICS FOR SOCIAL SCIENCES II
RAIN SEMESTER EXAMINATION (2009/2010 SESSION)

INSTRUCTIONS:

- Attempt all questions in **Section A;**
- Answer only one question from **Section B.**
- Show all workings clearly

Time allowed: 2 hours

SECTION A

1. Give two reasons some knowledge of mathematics is relevant in social sciences.

2. Distinguish between the functions: $y = b^x$ $(b > 1)$ and $y = x^b$ $(b \neq 0)$

3. List three types of non-algebraic functions.

4. What is partial differentiation and why is it relevant in social sciences studies?

5. What is the primary goal of any optimization problem?

6. The formula for $\frac{d}{dx}\left(\frac{u}{v}\right)$ where u and v are functions of x is ……………………

7. If $f(x, y) = x^{\alpha} + xy^{\beta}$, where α and β are constants, evaluate f_{xx}, f_{yy} and f_{xy}.

8. The equation which involves one or more differential coefficients of an unknown function is referred to as a ……………………

9. Distinguish between differential calculus and integral calculus.

10. Tomi claims that the general result;

$$Z_{xy} = Z_{yx}$$

holds for $Z = \log \sin x - \log \cos y$, is Tomi correct?

11. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{vmatrix} =$ ……………………

12. Outline three techniques of evaluating the determinants of square matrices.

13. Determine x and y if $(x,\ x+y) = (y-2,\ 6)$

14. Given $A = \begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$, determine the cofactor of each element in the column 2 of A.

15. State the necessary and sufficient condition for the multiplication of two matrices.

SECTION B

1. *(a)* If A and B are two orthogonal square matrices of the same order. Prove that their product is also orthogonal.

   (b) If $M = \begin{pmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{pmatrix}$,

   (i) What type of matrix is M?

   (ii) Evaluate $M^3 + (a^2 + b^2 + c^2)$

2. *(a)* Differentiate between definite and indefinite integral.

   (b) Let $U = \int \frac{\sin x}{a \sin x + b \cos x} dx$ and

$$V = \int \frac{\cos x}{a\sin x + b\cos x}\,dx \text{, find:}$$

(i) $aU + bV$;

(ii) $aV - bU$.

3. *(a)* Suppose that the sales revenue (S) depends upon the quality of advertising (A) in a relationship as:

$$S = 14 + 16A - 2A^2$$

Find the value of A which maximizes S.

(b) Determine the value of x and y that will maximize the objective function $Z = xy$ subject to $y = x$.

SOLUTION TO THE PAST QUESTIONS

All topics needed here have been thoroughly treated through and through, all you need to do is to sit down and answer all these questions like a joke, you are not expected to start reading from here but from the topics, you make a joke of yourself when you read the concept of any subject starting from the side of the past question; more so, this text isn't a past question but a complete guide to lead you to a straight A in your SSC106 exam.

Hence, keep calm and check the solutions to these past questions one-by-one;

GOOD LUCK AND GOD'S BEST!

SOLUTION TO THE SSC106 EXAMINATION 2009/2010 ACADEMIC SESSION

The instruction is you answer all questions in the **Section A** and only one question from Section B. We'll be solving everything though, just sit tight as we solve.

Remember every singular solution here, you can get the full concept by reading this book and not the past question section exclusively;

SECTION A

Question 1

Give two reasons some knowledge of mathematics is relevant in social sciences.

Just two? Fine! You have it!

- It helps in Identifying and quantifying the relationship between variables that determine the outcome of the decisions and their alternatives in the social and management science.

- It minimizes subjectivity and enhances the chance of making objective decision.

Question 2

Distinguish between the functions:
$y = b^x$ $(b > 1)$ and $y = x^b$ $(b \neq 0)$

Of course, we even emphasized this when in the study of functions.

The first function: $y = b^x$ $(b > 1)$ is an exponential function; since x, the independent variable is an exponent, while the second one; $y = x^b$ $(b \neq 0)$ is a power function since x, the independent variable is being raised to a constant power.

The stuffs in bracket are formalities that describe the values for which those functions are valid;

Question 3

List three types of non-algebraic functions.

Transcendental functions are the opposite of algebraic functions; hence, non-algebraic functions are transcendental functions.
There are three transcendental functions;

- Exponential functions
- Trigonometric functions
- Logarithm functions

Question 4

What is partial differentiation and why is it relevant in social sciences studies?

Partial differentiation is the differentiation of multivariable functions which yields several partial derivatives (differential coefficients). **A partial derivative** of a function of several variables (the multivariate functions) is its derivative with respect to one of the variables that constitute the function with other variables ***temporarily kept constant.***

Partial differentiation is very useful in the study of social sciences because there are many practical cases in real world where useful functions such as cost, revenue, profit and etc are dependent on more than one variable and the need for optimization of all these depend on partial differentiation.

Question 5

What is the primary goal of any optimization problem?

The primary goal of an optimization problem is to find the minimum and (or) maximum values of a function.

Question 6

The formula for $\frac{d}{dx}\left(\frac{u}{v}\right)$ where u and v are functions of x is ……………………

$$\frac{d}{dx}\left(\frac{u}{v}\right)$$

The above implies the derivative of a quotient with u above and v below; hence; we know the quotient formula;

$$\frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

Question 7

If $f(x, y) = x^{\alpha} + xy^{\beta}$, where α and β are constants, evaluate f_{xx}, f_{yy} and f_{xy}.

Wow! We'll have to solve something here; we've been writing since!

$$f(x, y) = x^{\alpha} + xy^{\beta}$$

Taking the first order partial derivatives, you know the issue of variables being temporarily kept constant;

$$f_x = \alpha x^{\alpha-1} + 1 \times x^{1-1}y^{\beta}$$

$$f_x = \alpha x^{\alpha-1} + y^{\beta}$$

$$f_y = 0 + \beta \times xy^{\beta-1}$$

$$f_y = \beta xy^{\beta-1}$$

Going for the second order partial derivatives we were told to find, we have;

$$f_{xx} = \frac{\partial}{\partial x}(f_x) = \frac{\partial}{\partial x}\left(\alpha x^{\alpha-1} + y^{\beta}\right)$$

$$f_{xx} = (\alpha - 1) \times \alpha x^{(\alpha-1)-1} + 0$$

$$f_{xx} = (\alpha - 1)\alpha x^{\alpha-2}$$

$$f_{yy} = \frac{\partial}{\partial y}\left(f_y\right) = \frac{\partial}{\partial y}\left(\beta x y^{\beta-1}\right)$$

$$f_{yy} = (\beta - 1) \times \beta x y^{(\beta-1)-1}$$

$$f_{yy} = (\beta - 1)\beta x y^{\beta-2}$$

$$f_{xy} = \frac{\partial}{\partial y}(f_x) = \frac{\partial}{\partial y}\left(\alpha x^{\alpha-1} + y^{\beta}\right)$$

$$f_{xy} = 0 + \beta \times y^{\beta-1}$$

$$f_{xy} = \beta y^{\beta-1}$$

Question 8

The equation which involves one or more differential coefficients of an unknown function is referred to as a …………………

This is simply: **differential equation**

Question 9

Distinguish between differential calculus and integral calculus.

Differential calculus is the process of finding the derivative of a function while **integral calculus** is the process of finding a function from its derivative.

Differentiation deals with the rate of change of a quantity with respect to another, while **integration** deals with the area under the curve of a function. The two processes are reverse processes with respect to each other.

Question 10

Tomi claims that the general result;

$$Z_{xy} = Z_{yx}$$

holds for $Z = \log \sin x - \log \cos y$, is Tomi correct?

$$Z = \log \sin x - \log \cos y$$

Quite another lengthy question!

When differentiating x, y is a constant and vice versa;

$$Z_x = \frac{\partial}{\partial x}(\log \sin x - \log \cos y)$$

$\log \cos y$ is a constant in this case;
Substitution!

$$u = \sin x$$

$$\frac{du}{dx} = \cos x$$

Hence;
We have:

$$Z = \log u - \log \cos y$$

$\log \cos y$ remains a constant;

$$\frac{\partial Z}{\partial u} = \frac{\partial}{\partial u}(\log u) = \frac{1}{u \ln 10}$$

Hence;
Chain rule;

$$Z_x = \frac{\partial Z}{\partial u} \times \frac{du}{dx}$$

$$Z_x = \frac{1}{u \ln 10} \times \cos x$$

Return u;

$$Z_x = \frac{\cos x}{\sin x \ln 10} = \frac{\cot x}{\ln 10}$$

Note:

The trigonometry identity that:

$$\boldsymbol{\frac{\cos x}{\sin x} = \cot x}$$

$$Z = \log \sin x - \log \cos y$$

When differentiating y, x is a constant and vice versa;

$$Z_y = \frac{\partial}{\partial y}(\log \sin x - \log \cos y)$$

$\log \sin x$ is a constant;

Substitution!

$$w = \cos y$$

$$\frac{dw}{dy} = -\sin y$$

Hence;

We have:

$$Z = \log \sin x - \log w$$

$\log \sin x$ remains a constant;

$$\frac{\partial Z}{\partial w} = \frac{\partial}{\partial w}(-\log w) = -\frac{1}{w \ln 10}$$

Hence;

Chain rule;

$$Z_y = \frac{\partial Z}{\partial w} \times \frac{dw}{dy}$$

$$Z_y = -\frac{1}{w \ln 10} \times -\sin y$$

Return w;

$$Z_y = \frac{\sin y}{\cos y \ln 10} = \frac{\tan y}{\ln 10}$$

Note the trigonometry identity that:

$$\boldsymbol{\frac{\sin x}{\cos x} = \tan x}$$

Remains;

$$Z_{xy} = Z_{yx}$$

$$Z_{xy} = \frac{\partial}{\partial y}(Z_x) = \frac{\partial}{\partial y}\left(\frac{\cot x}{\ln 10}\right)$$

SOFT!

There is no y in Z_x; hence, everything are constants and;

$$Z_{xy} = 0$$

$$Z_{yx} = \frac{\partial}{\partial x}\left(Z_y\right) = \frac{\partial}{\partial x}\left(-\frac{\tan y}{\ln 10}\right)$$

SOFT!
There is no x in Z_y; hence, everything are constants and;

$$Z_{yx} = 0$$

Hence; Tomi is right as $Z_{xy} = Z_{yx}$

If you got different values, you should already know you are wrong as Young's theorem exists for all functions.

Question 11

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{vmatrix} = \ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

Determinant stuff! You know how its done;

We have:

$$1\begin{vmatrix}2 & 3\\3 & 6\end{vmatrix} - 1\begin{vmatrix}1 & 3\\1 & 6\end{vmatrix} + 1\begin{vmatrix}1 & 2\\1 & 3\end{vmatrix}$$

$$\big((2\times 6)-(3\times 3)\big)-\big((1\times 6)-(3\times 1)\big)+\big((1\times 3)-(1\times 2)\big)$$

$$3-3+1$$

Hence;

$$\begin{vmatrix}1 & 1 & 1\\1 & 2 & 3\\1 & 3 & 6\end{vmatrix} = 1$$

Question 12

Outline three techniques of evaluating the determinants of square matrices.

Simple, we discussed it in the notes;

- Open-scissors technique
- The Laplace expansion method
- The Sarrus sule

Question 13

Determine x and y if $(x,\ x+y) = (y-2,\ 6)$
Well, simple. This is a matrix equality situation, in honesty, you could mix this up! It's still a matrix, don't be misled, row matrices are sometimes separated by commas.

Hence, from these matrices;

$$(x, \qquad x+y) = (y-2, \qquad 6)$$

We have, each positions are equal to each other, equality of matrices:

$$x = y - 2 \ldots\ldots\ldots (1)$$

$$x + y = 6 \ldots\ldots\ldots (2)$$

Hence, put (1) into (2);

$$x + y = 6$$
$$y - 2 + y = 6$$
$$2y - 2 = 6$$

Here,

$$y = 4$$

Put in (1);

$$x = 2$$

Question 14

Given $A = \begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$, determine the cofactor of each element in the column 2 of A.

The column 2 of the matrix are the elements b, c and a; let's find their cofactor, but minors first!

$$min(b) = \begin{vmatrix} b & a \\ c & b \end{vmatrix} = b(b) - a(c) = b^2 - ac$$

$$min(c) = \begin{vmatrix} a & c \\ c & b \end{vmatrix} = ab - c(c) = ab - c^2$$

$$min(a) = \begin{vmatrix} a & c \\ b & a \end{vmatrix} = a(a) - c(b) = a^2 - cb$$

From the cofactor matrix notation;

$$\begin{pmatrix} + & - & + \\ - & + & - \\ + & - & + \end{pmatrix}$$

Hence, we have;

$$cofactor(b) = -(b^2 - ac) = ac - b^2$$
$$cofactor(c) = +(ab - c^2) = ab - c^2$$
$$cofactor(a) = -(ab - c^2) = c^2 - ab$$

Question 15

State the necessary and sufficient condition for the multiplication of two matrices.

Too much English, they're asking for the conformability condition for matrix multiplication.

For two matrices to be multiplied; the number of columns in the pre-multiplier must be equal to the number of rows in the post-multiplier.

SECTION B

Question 1

(a) If A and B are two orthogonal square matrices of the same order. Prove that their product is also orthogonal.

(b) If $M = \begin{pmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{pmatrix}$,

(iii) What type of matrix is M?

(iv) Evaluate $M^3 + (a^2 + b^2 + c^2)$

(a)

This has been solved in the notes already, we'll test for the products, either way, i.e., AB and BA;

For an orthogonal matrix, A;

$$A^T = A^{-1}$$

To test for their product, either way! We are to prove that the matrices AB and BA are both orthogonal.

Now, if A and B are orthogonal, it follows that:

$$A^T = A^{-1}$$
$$B^T = B^{-1}$$

To prove that AB and BA are orthogonal, we must test for the value of the transposes of AB and BA; Hence, for AB; we test for:

$$(AB)^T$$

Now, from transpose rules;

$$(AB)^T = B^T A^T$$

Hence,
We have:

$$(AB)^T = B^T A^T$$

From the fundamental information we have for A and B that they are orthogonal, we know that:

$$A^T = A^{-1}$$
$$B^T = B^{-1}$$

Hence, by substitution for B^T and A^T, we have;

$$(AB)^T = B^{-1}A^{-1}$$

Also, from inverse rules;

$$(AB)^{-1} = B^{-1}A^{-1}$$

Hence, we can hence substitute for $B^{-1}A^{-1}$ in our equation to arrive that:

$$(AB)^T = (AB)^{-1}$$

Hence, it is proved that the transpose of AB is equal to its inverse which is the condition for it to be orthogonal.

Going to the next part, proving for BA;

For BA; we test for:

$$(BA)^T$$

Now, from transpose rules;

$$(AB)^T = B^T A^T$$

Hence,
We have:

$$(BA)^T = A^T B^T$$

From the fundamental information we have for A and B that they are orthogonal, we know that:

$$A^T = A^{-1}$$
$$B^T = B^{-1}$$

Hence, by substitution for A^T and B^T, we have;

$$(BA)^T = A^{-1} B^{-1}$$

Also, from inverse rules; we know that the inverse of a product is the reverse product of their individual inverses:

$$(AB)^{-1} = B^{-1}A^{-1}$$

It follows that:

$$(BA)^{-1} = A^{-1}B^{-1}$$

Hence, we can hence substitute for $A^{-1}B^{-1}$ in our equation to arrive that:

$$(BA)^{T} = (BA)^{-1}$$

Hence, it is proved that the transpose of BA is equal to its inverse which is the condition for it to be orthogonal.

(b)

(i)

$$M = \begin{pmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{pmatrix}$$

This matrix above is obviously a **skew-symmetric** matrix. If the matrix is transposed, it'll be equal to the negative of the original matrix.

Checking this;

$$M^T = \begin{pmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{pmatrix}^T$$

$$M^T = \begin{pmatrix} 0 & -a & -b \\ a & 0 & -c \\ b & c & 0 \end{pmatrix}$$

Obviously;

$$M = -M^T$$

(ii)

I guess there is a problem with this question;

$$M^3 + (a^2 + b^2 + c^2)$$

M^3 appropriately is the cube of the matrix M which means multiplying M by itself in three places but that isn't the issue, a matrix isn't added to scalars (ordinary variables or numbers); hence, I'll assume the question was meant to be

$$|M|^3 + (a^2 + b^2 + c^2)$$

This is because the determinant of a matrix is scalar and hence, its cube can be added with other scalars as well.

So, then, let's find $|M|$

$$|M| = \begin{vmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{vmatrix}$$

$$0\begin{vmatrix} 0 & c \\ -c & 0 \end{vmatrix} - a\begin{vmatrix} -a & c \\ b & 0 \end{vmatrix} + b\begin{vmatrix} -a & 0 \\ -b & -c \end{vmatrix}$$

$$0[0(0) - (c)(-c)] - a[(-a)(0) - (c)(b)] + b[(-a)(-c) - (0)(b)]$$

$$0 - a(-bc) + b(ac)$$

Hence,

$$|M| = abc + abc = 2abc$$

Hence, we have our sum:

$$|M|^3 + (a^2 + b^2 + c^2)$$

$$2abc + (a^2 + b^2 + c^2) = a^2 + b^2 + c^2 + 2abc$$

Question 2

(a) Differentiate between definite and indefinite integral.

(b) Let $U = \int \frac{\sin x}{a \sin x + b \cos x} dx$ and

$V = \int \frac{\cos x}{a \sin x + b \cos x} dx$, find:

(iii) $aU + bV$;

(iv) $aV - bU$.

(a)

Two simple differences;

- The **indefinite integral** gives the general form of the anti-derivative of a function; the **definite integral** gives the area under a curve between two given points and is the value gotten by evaluating the integral from the two limits.
- The **indefinite integral** also contains an arbitrary constant while a **definite integral** doesn't contain an arbitrary constant.

(b)

This has been thrashed in the notes, kindly see the explanation for details; you should have read it before coming to past questions though;

$$U = \int \frac{\sin x}{a \sin x + b \cos x} dx$$

$$V = \int \frac{\cos x}{a \sin x + b \cos x} dx$$

$$aU + bV$$

Go ahead and multiply them;

$$aU = a \int \frac{\sin x}{a \sin x + b \cos x} dx$$

Take the a inside the integral, if it was inside, we could take it outside, so now, let's do the reverse;

$$aU = \int \frac{a(\sin x)}{a \sin x + b \cos x} dx$$

In same way;

$$bV = b \int \frac{\cos x}{a \sin x + b \cos x} dx$$

Take the b inside the integral, if it was inside, we could take it outside, so now, let's do the reverse;

$$bV = \int \frac{b(\cos x)}{a \sin x + b \cos x} dx$$

$aU + bV$ will be given by:

$$\int \frac{a(\sin x)}{a \sin x + b \cos x} dx + \int \frac{b(\cos x)}{a \sin x + b \cos x} dx$$

So, another most basic integral rule; these are split integral; they could be together before they are split, let's bring them together as if we were there before;

$$\int \left(\frac{a(\sin x)}{a \sin x + b \cos x} + \frac{b(\cos x)}{a \sin x + b \cos x}\right) dx$$

Let's add that fraction within; the denominators are the same so we can add them straight with one common denominator;

$$\int \left(\frac{a(\sin x) + b(\cos x)}{a \sin x + b \cos x}\right) dx$$

$$\int \left(\frac{a \sin x + b \cos x}{a \sin x + b \cos x}\right) dx$$

Cancel off!

$$\int (1)\, dx = x + C$$

Hence;

$$aU + bV = x + C$$

The question was actually little of asking you about integration laws but the properties of integration; we'll be treating the second part just like this;

$$aV - bU$$

$$aV = a \int \frac{\cos x}{a \sin x + b \cos x} dx$$

Take the a inside the integral, if it was inside, we could take it outside, so now, let's do the reverse;

$$aV = \int \frac{a \cos x}{a \sin x + b \cos x} dx$$

$$bU = b \int \frac{\sin x}{a \sin x + b \cos x} dx$$

Take the b inside the integral, if it was inside, we could take it outside, so now, let's do the reverse;

$$bV = \int \frac{b \sin x}{a \sin x + b \cos x} dx$$

$aV - bU$ will be given by:

$$\int \frac{a \cos x}{a \sin x + b \cos x} dx - \int \frac{b \sin x}{a \sin x + b \cos x} dx$$

So, another most basic integral rule; these are split integral; they could be together before they are split, let's bring them together as if we were there before;

$$\int \left(\frac{a \cos x}{a \sin x + b \cos x} - \int \frac{b \sin x}{a \sin x + b \cos x} \right) dx$$

Let's subtract that fraction within; the denominators are the same so we can add them straight with one common denominator;

$$\int \left(\frac{a \cos x - b \sin x}{a \sin x + b \cos x} \right) dx$$

It’s not looking to cancel each other as the previous part; however, checking the denominator, the numerator could be its derivative;

Let’s see;

$$z = a \sin x + b \cos x$$

$$\frac{dz}{dx} = a \cos x + b(-\sin x)$$

$$\frac{dz}{dx} = a \cos x - b \sin x$$

That obviously is the numerator; hence; here;

$$dx = \frac{dz}{a \cos x - b \sin x}$$

Hence, we have;

$$\int \left(\frac{a \cos x - b \sin x}{z}\right) \times \frac{dz}{a \cos x - b \sin x}$$

$a \cos x - b \sin x$ cancels out;

$$\int \left(\frac{1}{z}\right) dz = \ln z$$

Return the substitution;

We have;

$$\ln(a \sin x + b \cos x) + C$$

Of course the arbitrary constant cannot be forgotten, we have that;

$$aV - bU = \ln(a \sin x + b \cos x) + C$$

Question 3

(a) Suppose that the sales revenue (S) depends upon the quality of advertising (A) in a relationship as:

$$S = 14 + 16A - 2A^2$$

Find the value of A which maximizes S.

(b) Determine the value of x and y that will maximize the objective function $Z = xy$ subject to $y = x$.

(a)

$$S = 14 + 16A - 2A^2$$

To maximize S, the marginal sales revenue is zero!

$$MS = \frac{d}{dA}(S) = \frac{d}{dA}(14 + 16A - 2A^2)$$

Don't get worked up, MR, marginal revenue and MS, marginal sales revenue are same things, just change of words, revenues come from sales anyway!

Hence;

$$MS = 0 + 1 \times 16A^{1-1} - 2 \times 2A^{2-1}$$

$$MS = 16 - 4A$$

At maximum revenue;

$$MS = 0$$

Hence;

$$16 - 4A = 0$$

By solving;

$$A = 4$$

Hence, the value of A which maximizes S is 4.

(b)

This question is just like:

Max $Z = xy$
subject to $y = x$.

Hence,
Objective function: $Z = xy$
Constraint function; $y - x = 0$

Note that we have expressed constraint equated to zero; we can use any method, either the direct substitution or the Lagrangean multiplier, however, let's just use the Lagrangean method.

We write the Lagrangean expression here, Introducing the Lagrangean multiplier:

Following the rule below:

$$\mathcal{L}(x, y, \lambda) = f(x, y) - \lambda \times g(x, y)$$

We have:

$$\mathcal{L}(x, y, \lambda) = xy - \lambda(y - x)$$

$$\mathcal{L}(x, y, \lambda) = xy - y\lambda + x\lambda$$

Take the first order partials of $\mathcal{L}(x, y, \lambda)$ with respect to x, y and λ. As you are differentiating partially for any variable in the function, the rest are taken as constants, as usual.

$$\mathcal{L}_x = 1 \times x^{1-1}y - 0 + 1 \times x^{1-1}\lambda$$

$$\mathcal{L}_x = y + \lambda$$

$$\mathcal{L}_y = 1 \times xy^{1-1} - 1 \times y^{1-1}\lambda + 0$$

$$\mathcal{L}_y = x - \lambda$$

$$\mathcal{L}_\lambda = 0 - 1 \times y\lambda^{1-1} + 1 \times x\lambda^{1-1}$$

$$\mathcal{L}_\lambda = -y + x$$

From the first order partials, equate everything to zero, I mean each of the first partials; that's similar to the first order conditions;

$\mathcal{L}_x = y + \lambda = 0$ ... ...(1)

$\mathcal{L}_y = x - \lambda = 0$ ... ...(2)

$\mathcal{L}_\lambda = -y + x = 0$ ... ...(3)

Solving simultaneously;

From (2);

$$x = \lambda \text{ ... ...(4)}$$

Put (4) in (1);

$$y + x = 0 \text{ ... ... (5)}$$

Solving (5) and (3) simultaneously;

$-y + x = 0$ ... ...(3)

$y + x = 0$ ... ... (5)

(3) − (5);

$$-2y = 0$$
$$y = 0$$

Substitute in (3);

$$-0 + x = 0$$

$$x = 0$$

We were told to find the values of x and y and hence, we do not need λ, hence,

$$x = 0$$
$$y = 0$$

In actual fact, it is a minimization problem not a maximization problem. Just a little error in the question!