# NATIONAL OPEN UNIVERSITY OF NIGERIA 

PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY, JABI - ABUJA FACULTY OF SOCIAL SCIENCES

2020_2 EXAMINATION
COURSE CODE: ECO459
COURSE TITLE: ADVANCED MATHEMATICAL ECONOMICS CREDIT UNITS: 2 UNITS
TIME ALLOWED: 2 HOURS (2HRS)
INSTRUCTION: 1. INDICATE YOUR MATRICULATION NUMBER CLEARLY
2. ANSWER THREE QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS

## Question 1

a. Solve for x and y in the following equations
i. $\quad 3 x+2 y=10$
5.3marks
ii. Given $4^{8 x} \times 8^{4 x-2}=32^{2 x} \times 64^{2 x-4}$

Find $x$
4marks
b Solve for $x$ and $y$ in the following equations

$$
\begin{aligned}
& 3 x+2 y=10 \\
& 4 x+6 y=12
\end{aligned}
$$

6marks
c. The $3^{\text {rd }}$ term of an AP is 15 and the $6^{\text {th }}$ term is 27 . Find the first term, the common differences and hence the sum of the first 10 terms.

8marks

## Question 2

a. Differentiate using the first principle with respect to $x$

$$
\mathrm{Y}=2 x^{2}-x+3
$$

## 7.3marks

bi. Differentiate with respect to x
i. $\quad \mathrm{Y}=(2 x-1)\left(x^{3}+3\right)$

4marks
ii. $\quad$ ii. $\mathrm{y}=\left(3 x^{2}+2\right)^{4}$
iii. If $y=\log _{a} 2 x$, find $\frac{d y}{d x}$

4marks
iv. $\quad$ Given $\frac{d x}{}$.
iv. Given that the demand function of a consumer is $\mathrm{Q}=10-4 \mathrm{P}$, find the elasticity at P $=2$ and $\mathrm{P}=3$.

4marks

## Question 3

a. Maximize the following Total Revenue Function
$T R=240 \mathrm{Q}-8 \mathrm{Q}^{2}$
5.3marks
b. Minimize the following Total Cost Function
$T C=6 Q^{3}-36 Q^{2}+384 Q+200$
8marks
c. Given the following Total Revenue and Total Cost Function of a firm. Maximize the profit of the firm.

$$
\begin{aligned}
& \mathrm{TR}=700 \mathrm{Q}-3 \mathrm{Q}^{2} \\
& \mathrm{TC}=750+40 \mathrm{Q}
\end{aligned}
$$

## 10marks

## Question 4

a. Find the integration of the following:
i. $\int 4 x^{2} d x$

## 2.5marks

ii. $\quad \int 4 x^{-1} d x$
2.5marks
b. Using Integration by Part, integrate the following

$$
\int 3 x\left(2 x^{2}+3\right)^{2} d x
$$

## 10.3marks

c. The marginal cost (MC) of an oil producing firm is found to $6 q^{2}+24 q+500$. Find the variable cost (VC) of producing 200 barrels of oil (Q) per day.

## Question 5

a. Define briefly
i. Differential equation
ii. Difference equation
b. Give that:
$D_{\mathrm{t}}=-\mathrm{P}_{\mathrm{t}}+240$
$\mathrm{S}_{\mathrm{t}}=-0.2 \mathrm{P}_{\mathrm{t}-1}+120$
And initial price $\left(\mathrm{P}_{\mathrm{o}}\right)=200$
i. Establish the market price $P_{t}$ (time path)
ii. Equilibrium price $\mathrm{P}_{\mathrm{e}}$
iii. Comment on the stability condition of the model.

## 4marks <br> 4marks

## 10.3marks

2.5marks
2.5marks

