BACHELOR OF ARTS EXAMINATION, 2018

(1st Year, 1st Semester)

ECONOMICS (HONOURS)

MATHEMATICS FOR ECONOMICS

Time : Two hours   Full Marks : 30

Answer question (1) and any five questions from the rest.

1. (a) Using extreme value theorem show that $(1-t^2)$ has an optimum value in the interval (0,1)

    (b) Characterize the curvature of the function $f(x)=x^3$ where $f: R \rightarrow R$. Does the result change if $f: R^+ \rightarrow R^+$?

    (c) Find the limit of $f(x)=x$ from definition.

    (d) Find the asymptotes &/or holes in the function:
    $$f(x) = \frac{3x + 2}{x^2 - 9}$$

    (e) Find a formula involving $\wedge$, $\vee$ and $\neg$ that has the following truth table:

P	Q	???
F	F	F
F	T	T
T	F	T
T	T	F

    (f) Let us define a relation R={(x,y)│x,y∈Z∧x-y= 6, where x,y∈R}. Check whether the properties of reflexivity, symmetry and transitivity are satisfied by the relation.   5 x 2 = 10

2. (a) State & prove Bolanzo's theorem.
    (b) Using Bolanzo's theorem show that the equation $x^3+x-1=0$ has at least one real root in the interval [0,1].
    (c) Let $f(x)= x^3-x+6$. Sketch the graph of the function & identify any extremum if it/they exist.
                                                                    3+1+6

3. a. Find the domain of the following functions:
    i. $\frac{2x+5}{3x-6}$
    ii. $\sqrt{9 - x^2}$
    iii. $\frac{x^2+x+4}{4x^2+4x+1}$
    iv. $\frac{x}{x^2-x-30}$
    v. $log x$

b. Explain the conditions under which a function can have inverse. Write down a function that has inverse and show that the function satisfies all the conditions.   5+5

4. (a) Using the definition of continuity prove that if f(x) and g(x) are continuous functions then f(x).g(x) is also continuous. Is the same true for f(x)/g(x) ? Give a proof of your result.

(b) Using the above results check the continuity of $\frac{2x+3y}{x^2-1}$ 7+3