Final Assessment (Spring 2021)
Department of Mathematics & Physics
School of Engineering & Physical Sciences
North South University

Course Instructor:
Afroja Parvin (APv)

COURSE CODE: MAT 116 **TITLE: PRE-CALCULUS** **SEC - 10**

Instructions:

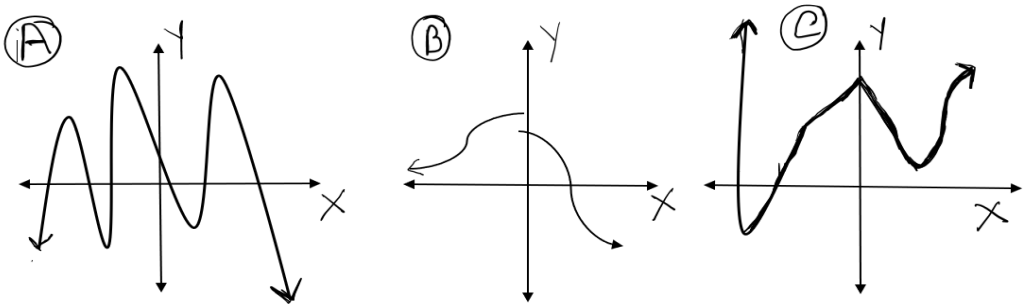
- *You must answer all the questions.*
- *You may prepare the assignment by typing or by handwriting. For handwritten, please write your answers neatly in a clear white paper and compile your work into a single PDF.*
- *Write your ID at the top of each page of your assignment.*

Important Notes:

- ***You have to solve the assignment with honesty and integrity.***
- ***Submit the assignment as soon as you complete it.***
- ***You should not share your solutions with others. Each submission will be carefully examined and it may go through 'plagiarism test' on your assignment***
- ***Significant similarity (copying from others) would severely reduce marks from both.***
- ***This submission will carry 30% marks for grading.***

Problem 01:

(a) What is the degree of a polynomial function? Which one of the following is the graph of polynomial function? Explain why are the others are not?



(b) On the same coordinate axes, draw the graph of polynomials $y = x^3 - 4x^2 + x + 1$ and $y = -x^2 + 19x + 1$. Based on your sketch, find the coordinates of all points where the two graphs appear to intersect. (Show necessary steps)

(c) Find the remainder when $20x^{2000} - 15x^{365} + 15x - 16$ is divided by $x + 1$?

Problem 02:

(a) Find all the zeros of the polynomial $P(x) = 8\,x^5 + 36x^4 + 46x^3 + 7x^2 - 12x - 4$.

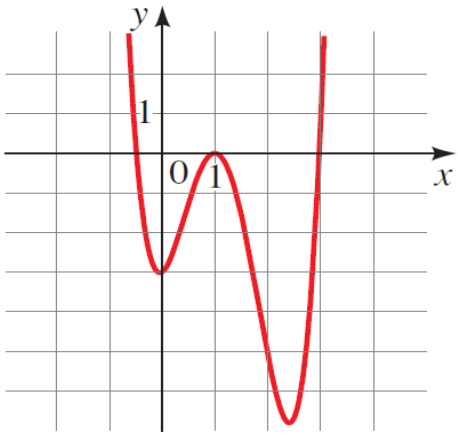
(b) From the given graph

i. Determine zeros, their smallest multiplicity and whether they touch or cross x-axis.

ii. How many turning points does the function has and what is the degree of the polynomial?

iii. What is the end behavior and y- intercept of the polynomial?

iv. Identify the equation of the polynomial.



Problem 03:

(a) Find a polynomial $P(x)$ with complex coefficients that satisfies the following conditions: $P(x)$ has degree two and zeros are i and $3 + i$, with the coefficient of the highest power of x is 1.

(b) i. If $(fog)(x) = 2(1 - \sin x)^3 + 3(1 - \sin x)^2 + \frac{1}{4}(1 - \sin x) + 10$, what is $f(x)$ and $g(x)$?

ii. If $g(x) = \frac{4}{x-5}$ and $h(x) = \frac{x+5}{x+3}$, what is the domain of $(goh)(x)$?

(c) Suppose the fish population in a pond is given by the formula $f(t) = \frac{2000t^2}{4(1+t)^2}$ where $t \geq 0$ is the time since the beginning of the year. In the long run, what will eventually happen to the fish population?

Problem 04:

(a) How do we determine graphically whether a function is one-to-one or not? Find the inverse of $f(x) = 2^{5^x}$. State the domain and range of $f(x)$ and $f^{-1}(x)$.

(b) Solve the logarithmic equation $\log_8(x + 5) + \log_8(x - 2) = 1$

(c) What is an angle in standard position? Illustrate with a graph? Are the angle 45^0 and 745^0 coterminal?

Problem 05:

(a) What is the amplitude, period and phase shift of $f(x) = 5\sin\left(2x - \frac{\pi}{8}\right)$? Draw the graph for one complete period.

(b) Find the values of the trigonometric function if $\cos\theta = -\frac{2}{7}$ and $\tan\theta < 0$.

(c) Find the exact value of the expression

i. $\cos\left(\sin^{-1}\frac{5}{6}\right)$ ii. $\sec\left(\sin^{-1}\frac{12}{13}\right)$

GOOD LUCK!