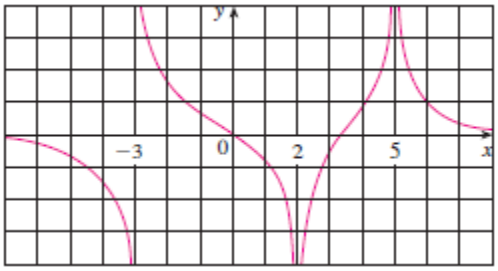
National University of Computer & Emerging Sciences
Islamabad

Department of Computer Sciences
Calculus and Analytical Geometry
Assignment # 2

Due Date: 16-10-2021
Course Instructor: Dr Sehrish Hassan Shigri

Instructions: Submit your scanned handwritten assignments on Google classroom as a single pdf file. Write your Name, Roll number and Section clearly on each page of your assignment. Any late submission will not be graded. Plagiarized assignments will be awarded zero.

1. For the functions whose graph is shown, state the following. (5)
a) $lim_{x\to -7} f(x)$ b) $lim_{x\to -3} f(x)$ c) $lim_{x\to 0} f(x)$ d) $lim_{x\to 6^-} f(x)$ e) $lim_{x\to 6^+} f(x)$
f) The equations of the vertical asymptotes



2. Sketch the graph of the function f with the specified properties. (5)
i) The domain of f is $[-1,1]$
ii) $f(-1) = f(0) = f(1) = 0$
iii) $lim_{x\to -1^+} f(x) = lim_{x\to 0} f(x) = lim_{x\to 1} f(x) = 1.$

3. Find the limits if possible. (8)
i) $lim_{t\to 9} \frac{9-t}{\sqrt{3}-t}$
ii) $lim_{y\to -\infty} \frac{2-y}{\sqrt{7+6y^2}}$
iii) $lim_{x\to \infty} \frac{e^x+e^{-x}}{e^x-e^{-x}}$
iv) $lim_{x\to \pi} \cos^2(x - tanx)$

4. Use the squeeze theorem to show that $lim_{x\to 0}(x^2 cos2\pi x) = 0$. Illustrate by graphing the functions $f(x) = -x^2, g(x) = x^2 cos2\pi x \;\; and \; h(x) = x^2$ on the same screen. (8)

5. Suppose that $f(x)$ and $g(x)$ are polynomials in x. Can the graph of $\frac{f(x)}{g(x)}$ have any asymptote if $g(x) \neq 0$? Give reasons of your answer. (4)

6. Suppose that a function is continuous everywhere and that $f(-2) = 3, f(-1) = -1, f(0) = -4, f(1) = 1 \; and \; f(2) = 5$. Does intermediate value theorem guarantee that f has a root on the following intervals? (5)

a) $[-2, -1]$ b) $[-1,0]$ c) $[0, 2]$

7. Find the values of m and k if possible that will make the function continuous everywhere? (7)

$$\begin{cases} x^2 + 5 & x > 2 \\ m(x+1) + k & -1 < x \leq 2 \\ 2x^3 + x + 7 & x \leq -1 \end{cases}$$

8. Identify the existence of Horizontal, Vertical or Oblique asymptote if it exists? (8)

i) $\frac{2x^3+7}{x^3-x^2+x+7}$

ii) $\frac{3x^7+5x^2-1}{6x^3-7x+3}$

9. Sketch the graph of the function if $f(0) = 0, lim_{x\to\pm\infty} f(x) = 0, \; lim_{x\to 1^-} f(x) = lim_{x\to -1^+} f(x) = \infty, \; lim_{x\to 1^+} f(x) = -\infty \; and \; lim_{x\to -1^-} f(x) = -\infty.$ (5)