Assignment No. 1

MTH101 (Spring 2015)

DON'T MISS THESE *Important instructions:*

- There are Four Sections and Each section carries 20 marks.

- Solve all questions of **ONLY THAT ONE SECTION** which is **directed** in your **ANNOUNCEMENT page**. If you do not solve the INSTRUCTED SECTION, your marks will be deducted. See your ANNOUNCEMENT page.

- Solve your assignment in **MS Word**, using **Math Type Software**.
- File with jpg or other image files will be awarded ZERO marks.

SECTION 1 (For the students with Section incharge Miss Zakia Rehmat.

Question: 1	**Marks: 5 + 5**

a) Solve the following inequality and write the solution in the form of intervals.

$$\left| \frac{3x}{5} - 1 \right| > \frac{2}{5}$$

b) Find the domain and range of the following function.

$$g(z) = \frac{1}{\sqrt{4 - z^2}}$$

Question: 2	**Marks: 3 + 2**

Consider the following function.

$$f(x) = \frac{x^3 - 2x^2}{3x - 6}$$

a)

Construct a table for the values of $f(x)$ corresponding to the following values of x and estimate the limits $\lim_{x \to 2^-} f(x)$ and $\lim_{x \to 2^+} f(x)$ respectively.

$x = 1.97, 1.9997, 1.999997, 1.98, 1.9998$

$x = 2.02, 2.01, 2.0002, 2.0001, 2.000001$

b)

Evaluate the limit $\lim_{x \to 2} f(x)$ algebraically.

Question: 3   **Marks: 5**

Write the function in the form of $y = f(u)$ and $u = g(x)$, then find $\dfrac{dy}{dx}$ as a function of x.

$$y = 5\cos^{-4} x + \sin x \cos x$$

Hint: Use "CHAIN RULE" to solve it

SECTION 2 (For the students registered with Section incharge Mr. Imran Talib)

Question: 1   **Marks: 5 + 5**

(a) Solve the following inequality and show the solution set on the real line.

$$\frac{x+4}{x-3} < 2$$

(b) Find the centre and radius of the circle with equation:
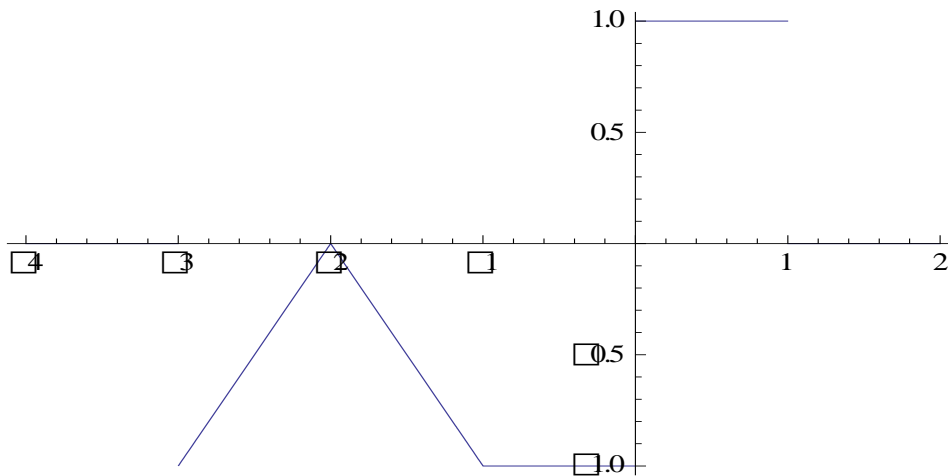
$$x^2 + y^2 - 10x + 8y - 59 = 0$$

(a) For the following function $s = f(t)$ graphed here, state whether the following limits exist or not?

If they exist then determine it. Moreover, if they do not exist then justify the answer with appropriate reason.

$$(I)\ \lim_{t \to -2} f(t)$$

$$(II)\ \lim_{t \to -1} f(t)$$

$$(III)\ \lim_{t \to 0} f(t)$$

(b) Let $h(x) = \dfrac{x^2 - 2x - 3}{x^2 - 4x + 3}$

(I) Make a table of the values of h at $x = 2.9$, 2.99, 2.999, 2.9999, and so on. Then estimate $\lim_{x \to 3} h(x)$.

What estimate do you arrive at if you evaluate h at $x = 3.1$, 3.01, 3.001, and so on?

(II) Find $\lim_{x \to 3} h(x)$ algebraically.

SECTION 3 (For the students registered with Section incharge Mr Muhammad Sarwar)

Given that A (5, 1) and B (3, 4). Find

(i) Slope of line joining A and B,

(ii) Equation of line passing through A and B

Question: 2   **Marks: 5**

Find the center and radius of the circle with equation,

$$3x^2 + 3y^2 - 21x + 6y + 7 = 0$$

Question: 3   **Marks: 5**

Evaluate, $\displaystyle \lim_{x \to 3} \frac{4x^2 - 36}{x - 3}$

Question: 4   **Marks: 5**

Find the derivative of $f(x) = 1 - x^2$ by definition $\left[f'(x) = \displaystyle \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \right]$

SECTION 4

(For the students registered with Section incharge Mr. Mansoor Khurshid)
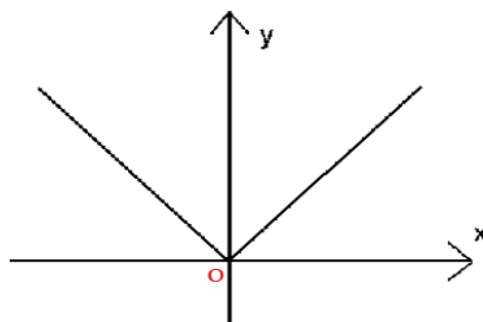
Question: 1   **Marks: 5**

Find the slope and y-intercept of the line $3x - 12y + 27 = 0$. Deduce the x-intercept from the equation of the line.

Question: 2   **Marks: 3 + 2**

(a) What do you judge about the differentiability of $f(x) = |x|$ at $x = 0$?

Support your answer with explanations and reasoning.

graph of f(x) = |x|

(b) Write names of two functions which are continuous on the set of real numbers R *i.e.* $(-\infty, \infty)$

Question: 3   **Marks: 2 + 3**

(a) Let $h(x) = 200$. Investigate the value of $h(x)$ when x approaches to ∞.

(b) Find $\dfrac{d}{dx}\left(\dfrac{\tan x}{\sin x} \right)$

Question: 4   **Marks: 5**

Find the derivative of the function $y = \sqrt{\sin x + \cos x - \sec x \tan x}$, using "CHAIN RULE" (i.e., by using some appropriate substitution).