MA1200 TAKE HOME PROBLEM SET 1

The following is the first take-home assignment of MA1200, which counts 3 point3 of total 100 of your final score of the course.

Please submit it via canvas in a pdf file (you can handwrite the answers and take photos by your phone, then make it into a pdf file, see for example, https://www.wikihow.com/Convert-JPG-to-PDF) for how to combine jpg files to a pdf; you can also do it by note-taking apps on an iPad or an Surface)

Q1. Find the equation of the straight line through $P(-1, 4)$ perpendicular to the line L, $x + 2y + 3 = 0$.

Q2. (a) Show that the equation $x^2 - 9y^2 + 2x + 36y - 44 = 0$ represents a hyperbola whose center is at the point $C(-1, 2)$

(b) Find the coordinates of the foci of the hyperbola, the equations of its asymptotes, and the coordinates of the points where the asymptotes cut the x-axis.

Q3. (a) Show that the equation $9x^2 + 16y^2 - 36x - 32y - 92 = 0$ represents an ellipse whose center is at the point $C(2, 1)$

(b) Find the coordinates of the foci of the ellipse

(c) Sketch the graph of the ellipse.

Q4.

$$f(x) = 3x - 2, \text{ for } x \in \mathbb{R} \quad \text{and} \quad g(x) = \frac{1}{x-2} \text{ for } x \in \mathbb{R}\backslash\{2\}$$

(a) Find the inverse function $f^{-1}(x)$ and state the largest possible domain and the range.

(b) Find $(g \circ f)(x)$, and state the largest possible domain and the range.

Q5. (a) Let $f(x) = (x-2)^2 - 3$ for $x \in [2, \infty)$, sketch its graph

(b) Find the inverse of $f(x)$ and state its largest possible domain.

Q5. Let $f(x) = (x - [x])^2$, $x \in \mathbb{R}$, where $[x]$ is the greatest integer not greater than x

(a) Sketch $y = f(x)$ for $-3 \leq x \leq 3$.

(b) Find the range of $f(x)$

(c) Is $f(x)$ a periodic function of x?

The assignment is due on 23:59 of September 27, Sunday.

You will lose 1 point for each day of late submission. All submissions after the midnight of September 30 will be marked as 0.

Date: September 18, 2020.