MA1200 Hand-in Assignment #1 due at 9:00AM (Hong Kong time zone) on October 5, 2024

Instructions to students:

1. *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 a Surface)*

2. *The assignment is due on* **9:00AM of October 5, 2024 (Saturday)**. *Your score of this assignment is only based on what appears on Canvas. Any unsuccessful submissions will* ***NOT*** *be marked, which results in your getting zero point.*

3. *Please write down your name and student ID.*

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10 points for every question below. There are totally ten questions. **Questions**:

1. Find equation of the line L. The line L is perpendicular to the line L_1 with equation $2x + 3y = 1 + y$. In addition, the line L intersects with the line L_2 at the point $(w, 3)$ where $w \in \mathbb{R}$. The equation of the line L_2 is $6y - 5x + 2 = 0$.

2. The line L passes through a point $(2t, t)$ where t is a negative real number. The slope of the line L is equal to $-\frac{4}{3}$. The portion of the line L in the third quadrant forms a triangle of area 27 with the negative coordinate axes. Find the value of t.

3. Find the equation of the circle which intersects with the line $y - 2x + 1 = 0$ at only one point. The center of this circle is $(1, 2)$.

4. Classify the following conic sections. Find its center, vertices, foci, directrix (if possible), asymptotes (if possible). Then, sketch its graph.
(a) $25x^2 + y^2 - 100x + 4y + 74 = 0$. (b) $-y^2 - 8x + 2y + 9 = 0$. (c) $16x^2 - 9y^2 - 32x + 36y - 151 = 0$.

5. Let $F(x) = \sqrt{-x^2 + 6x - 5}$ and $G(x) = \frac{3}{x^3 - 3x^2 + 3x - 1}$.

   (a) Find their largest possible domains and ranges.

   (b) Find $(F \circ G)(x)$ and states its largest possible domain.

6. Let $f(x)$ be a periodic function of x with period 3 and $f(x) = |2x - 1| + x$ for $-1 < x \leq 2$. Sketch the graph of the curve $y = f(x)$ in the interval $[-3, 4]$.

7. Solve $|4 - 3x| = 2|2x + 1|$.

8. Let $f(x) = (3x + 2 - [3x + 2])^2, x \in \mathbb{R}$, where $[x]$ is the greatest integer not greater than x.

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

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

   (c) Is $f(x)$ a periodic function of x? If yes, find the period. If not, state your reason.

9. Are the following functions even, odd, or neither? Justify your answers.
   (a) $f(x) = \frac{x^3+6x^2+12x+8}{x^4+1}$ (b) $f(x) = \frac{x^4}{x^3+3}$.

10. Show that the function $F(x) = x^3 + 3x^2 + 3x + 1$ with its domain $[-1, \infty)$ is one-to-one. You need to give detailed explanation. Find its inverse function. State the domain and range of F^{-1} clearly.

End