

## MA1200 Hand-in Assignment #1 due Oct. 8

*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 **23:59 of October 8 (Sunday)**. Late submissions will **NOT** be marked.
3. Please write down your name and student ID.

### Questions:

1. Find the line through  $(3, -8)$  which is perpendicular to the line  $L$  with equation  $3x + 2y = 1$ .
2. Find the possible slopes of a line that passes through  $(4, 3)$  so that the portion of the line in the first quadrant forms a triangle of area 27 with the positive coordinate axes.
3. Find the equation of the circle which passes through the points  $(2, 7)$ ,  $(1, 0)$  and  $(0, 3)$ .
4. Classify the following conic sections. Find its center, vertices, foci, directrix (if possible), asymptotes (if possible). Then, sketch its graph.
  - (a)  $9x^2 + 4y^2 - 18x + 8y - 23 = 0$ .
  - (b)  $y^2 - 8x + 2y + 9 = 0$ .
  - (c)  $9x^2 - 16y^2 - 36x + 32y - 124 = 0$ .
5. Find the largest possible domain and the corresponding range of the following functions:
  - (i)  $f(x) = \frac{5}{x^2 - 9}$ ,
  - (ii)  $g(x) = \sqrt{x^2 - 4x + 3}$ .
6. Let  $F(x) = \frac{1}{2-x}$  and  $G(x) = 1 - \frac{2}{x}$ .
  - (a) Find their largest possible domains and ranges.
  - (b) Find  $(G \circ F)(x)$  and states its largest possible domain.
7. Let  $f(x)$  be a periodic function of  $x$  with period 2 and  $f(x) = |x - 1| + x$  for  $0 < x \leq 2$ . Sketch the graph of the curve  $y = f(x)$  in the interval  $[-2, 4]$ .

8. Solve  $|5 - 2x| = 3|x + 1|$ .
9. Let  $f(x) = (2x - [2x])^2, x \in \mathbb{R}$ , 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.
10. Are the following functions even, odd, or neither? Justify your answers.
- (a)  $f(x) = \frac{x^3}{x^4+1}$
  - (b)  $f(x) = \frac{x^4}{x^3+1}$ .
11. The function  $F(x) = (x - 2)^2 + 3$  for  $x \in [2, \infty)$  is one-to-one. Find its inverse function. State the domain and range of  $F^{-1}$  clearly.

End