

# M203 REVISION QUESTIONS

## PART 1

### A Functions' and 'Numbers'

- 1) Draw a sketch of the graph of the function  $f$  defined by (90) (1A) Draw a sketch of the graph of the function  $f$  defined by (93)
- $$f(x) = \frac{x+3}{2x-3}$$
- $$f(x) = \frac{3x-4}{x-2}$$
- Your sketch should include:
- (a) any asymptotes to the graph;
- (b) points where the graph crosses the axes. [5]
- 2) Draw a sketch of the graph of the function  $f$  defined by (91)
- $$f(x) = \begin{cases} 1 + \cos(2x), & x \leq 0, \\ 2e^{-x}, & x > 0, \end{cases}$$
- indicating clearly its main features. [4]
- 3) Consider the function (88)
- $$f(x) = \begin{cases} x^2 - 1, & x < 0, \\ \sin 2x, & x \geq 0. \end{cases}$$
- Sketch the graph  $y = f(x)$ , indicating the main features. [5]
- 4) Consider the function
- $$f(x) = \frac{2x+1}{x+2}$$
- Draw a rough sketch of the graph of  $f$  including (87)
- (i) the vertical and horizontal asymptotes,
- (ii) the points where the graph crosses the axes. [5]
- 5) (a) Determine whether the conic defined by the parametric equations (89)
- $$x = 3t^2, y = 6t,$$
- is an ellipse, a parabola or a hyperbola.
- Sketch the graph of this curve, indicating on your graph the points  $t = 0, t = -1$  and  $t = 2$ . [3]
- (b) Determine whether the conic with equation
- $$x^2 + 3xy + 2y^2 - 5x - 9y + 1 = 0$$
- is an ellipse, a parabola or a hyperbola. [1]
- 6) (a) Solve the inequality (b) Find the solution set of the inequality (c) Show that
- $$|2x^2 - 5| < 3. \quad 3|x-3| < |x+1|. \quad \frac{5n}{n^2+6} < 1 \quad \text{for } n > 3.$$
- (d) Prove that (e) Solve the inequality
- $$3n^2 \geq (n+6)^2, \quad \text{for } n \geq 9. \quad \frac{4}{x} < \frac{x}{x-1}.$$
- 7) Determine the least upper bound of the set  $E$ , where
- (a)  $E = \{1 - \frac{1}{n^2} : n = 1, 2, 3, \dots\}.$
- Determine the greatest lower bound of the set  $E$ , where
- (b)  $E = \{3 + \frac{2}{n^2} : n = 1, 2, 3, \dots\}.$