MAS051 — Example Sheet 11

To be handed in: Friday, December 6th, 2002

1. Solve the following inequalities (i.e. give the range of values of x for which each inequality is satisfied):

(a) $2x + 8 < -2$ (b) $-3x - 9 \geq -3$ (c) $x + 2 > 2x - 6$

(d) $11 - x \leq 5x + 4$ (e) $2(x + 3) \geq 3(x + 2)$ (f) $x(x + 2) < x^2 + 1$

2. Solve the following factorised quadratic inequalities (giving your answer as the appropriate range of values of x):

(a) $(x + 2)(x - 2) > 0$ (b) $(2x + 3)(3x + 9) \leq 0$

(c) $(2x - 3)(6 - 3x) \geq 0$ (d) $(4 - x)(2x + 3) < 0$

3. Solve the following quadratic inequalities (giving your answer as the appropriate range of values of x):

(a) $x^2 + 4x - 5 > 0$ (b) $x(x - 1) < 6$ (c) $x(5 - 2x) \geq -3$

(d) $3x^2 - 4x - 5 < 0$ (e) $(x + 1)^2 \leq 5$ (f) $3x^2 - 4x + 5 \leq 0$

4. Find the stationary points of the following functions and determine their nature:

(a) $2x^3 - 9x^2 + 12x - 5$.

(b) $x^3 - 6x^2 - 15x + 7$.

(c) $\dfrac{x^2 - 2x + 4}{x^2 + 2x + 4}$.

5. What is the smallest value that the function $x^2 + \dfrac{16}{x}$ can take when x is positive?

6. Find the point on the line $3x + 4y = 10$ which is closest to the origin. [**Hint:** You are trying to find the point (x, y), where $3x + 4y = 10$, at which the quantity $x^2 + y^2$ is a minimum.]

AJD September 26, 2002