

## MA2004: Format of Seen Test 2 — One hour

1. (a) Convert

$$w = 2 + i$$

into modulus-argument form.

- (b) Find all the solutions to the equation

$$z^7 = 2 + i.$$

Give your answers in  $x$ - $y$  form correct to two decimal places.

2. Consider the surface defined by the equation

$$z = 2x^2 - 2xy + 2x + 7.$$

- (a) Find the tangent plane which touches this surface at the point where  $x = 6$  and  $y = -5$ .
- (b) Locate and describe all the critical points of the surface.

3. Consider the function of two variables given by

$$f(x, y) = x^2 + 2y^2 \quad \text{where} \quad \begin{cases} x = 4st + 6, \\ y = (t - 3)e^s. \end{cases}$$

- (a) Calculate the Jacobian  $\frac{\partial(x, y)}{\partial(s, t)} = \begin{vmatrix} \frac{\partial x}{\partial s} & \frac{\partial x}{\partial t} \\ \frac{\partial y}{\partial s} & \frac{\partial y}{\partial t} \end{vmatrix}$ .
- (b) Using the chain rule for functions of two variables, find the second order partial derivatives  $f_{ss}$ ,  $f_{st}$  and  $f_{tt}$ .

4. Evaluate

$$\iint_D 72\pi^2 x \cos(3\pi xy) \, dx \, dy$$

over the region  $D$  enclosed by the lines  $x = 5$  and  $y = 7$ , and the curve  $xy = 140$ .