

MATH201 – 1 TEST2

**Write Your Full Name in the Answer Sheet**

*Instructions:* **You must use words and sentences whenever necessary in your answer. Show all your work on the problems. You will be graded on the correctness of your methods as well as the accuracy of your answers.**

**1** The length and width of a rectangle are measured as 30cm and 24cm, respectively, with a possible error of 0.2 cm in each dimension. Use differentials to estimate the maximum error in calculating the area of the rectangle.

**3a)** If  $f(x, y) = x^2 + y$ , find the rate of change of  $f$  at the point  $P(2,0)$  in the direction from  $P$  to  $Q(1/2,2)$ .

**b)** In what direction does  $f$  change most rapidly at  $P$ ? What is this maximum rate of change?

**4** A rectangular box has a square base. Find the rate at which its volume is changing if its base edge is increasing at  $2\text{cm}/\text{min}$  and its height is decreasing at  $3\text{cm}/\text{min}$  at the instant when each dimension is 100 cm.

**5.** Find the dimensions of the rectangular box with maximum volume if the sum of the lengths of its 12 edges is 8.

**6.** Approximate the value of the integral

$$\int \int_R (x + y) dA$$

over the rectangle  $R = [0, 2] \times [0, 2]$ , by calculating the Riemann sum with  $m=2, n=2$  (two subintervals in each interval). Take the sampling points to be midpoint of each subrectangle.