

Math 100 — Second Midterm

Instructor: Dr. Sandy Rutherford

Date: November 12, 2004

Time: 11:30 – 12:20

Name (please print):_____

Signature:_____

Student Number:_____

- Read the questions carefully, show all of your work and present organised solutions. If we do not understand what you are doing, you will receive *zero marks*. You *must* give reasons for your answers.
- No calculators of *any* kind may be used. The use of any type of calculator is considered as *academic dishonesty*.
- No notes or textbooks may be used.
- Some answers may contain radicals of the form $\sqrt{2}$. These should be simplified where possible; however, a decimal expansion is not required.
- If you require more room for your solutions, you may use the backs of the pages. However, cross out any rough work that you do not wish to be graded.
- This exam has 8 pages, including this cover page. Please be sure that you have all of the pages.

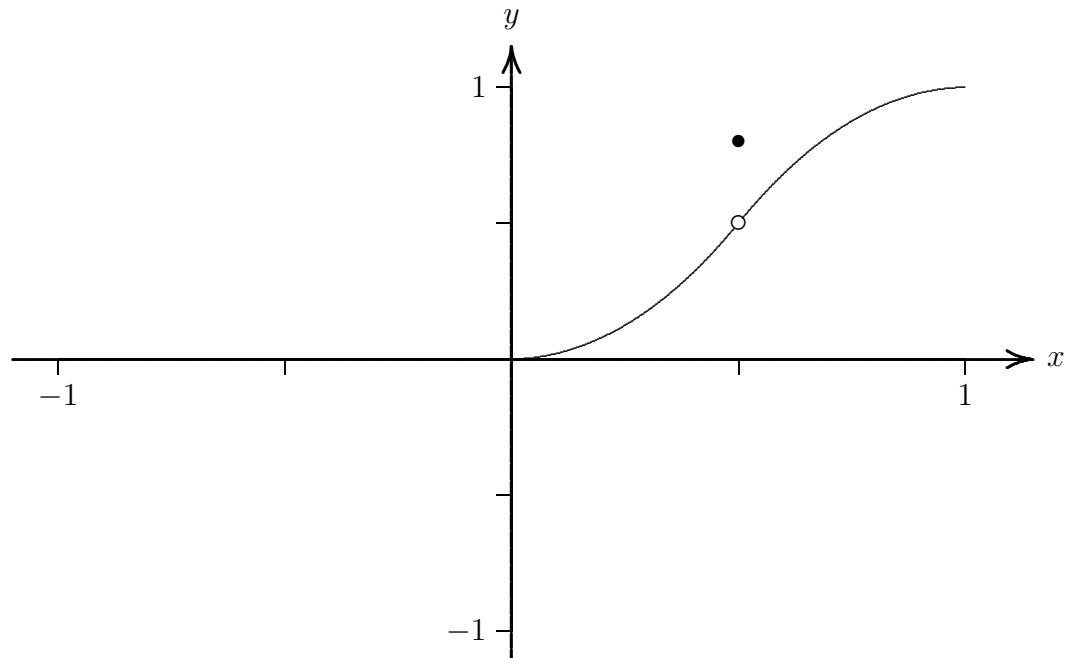
Question	Mark	Total Marks
1		6
2		5
3		8
4		8
5		8
Total		35

1. For the following functions, determine the inverse function. Be sure to state the domain of the inverse function explicitly.

(a) $f(x) = 2x + 3$

(b) $g(x) = \sqrt{x}$

2. (a) The graph below is a partial graph for a function which has domain $[-1, 1]$ and which is odd under reflection about the y -axis. Sketch in the remainder of the graph.



- (b) State the definition of an odd function.

3. State the domain and range of each of the following functions. Also, calculate the y -intercept, find any roots, find all asymptotes (horizontal, vertical, or slant), and state which functions are even or odd under reflection about the y -axis. Finally, sketch a reasonably accurate graph for each function.

(a) $g(x) = \frac{1}{4} 2^x$

(b) $f(x) = \frac{x^3 + x}{x^2 - 4}$

4. Define

$$f(x) = \begin{cases} 1, & \text{for } x \leq 0 \\ (x-1)^2, & \text{for } x > 0 \end{cases} \quad \text{and} \quad p(x) = 2x^2 - x - 1.$$

(a) Sketch a reasonably accurate graph of f .

(b) Sketch a reasonably accurate graph of p .

- (c) Find all values of x for which the composition $p \circ f$ satisfies $(p \circ f)(x) = 0$.

5. We will use a quadratic equation to model the blood alcohol concentration of a student who has just drunk 3 bottles of beer. The student's blood alcohol concentration, which was initially 0%, returns to 0% after 4 hours. When was the maximum concentration reached? Suppose that the student's blood alcohol concentration was measured as 0.09% one hour after drinking the beer. What was the maximum value of the blood alcohol concentration?