NAME ....

STUDENT ID ....

DEGREE ....

Are You Approved for Extra Time in Exams (LENS students only) ....

Examination Procedures

- This exam will start at 11:05, and will last 45 minutes.

- Each question will be worth either 2 or 3 Marks. There are 15 Marks worth of questions.

- All questions must be attempted (LENS students please see below)

- Write all of your answers in the exam script. Write the script number on any other documents you submit.

- It is your responsibility to return the script to collection box. An audit of scripts will take place immediately after the exam. If your script is account for in that audit, you are deemed to be absent, and will receive no marks.

- **LENS Student** Specifically approved LENS students have to answer any selection of questions that have an aggregate mark of 11 Marks.

  - They may skip any two of the 2-Mark Questions
  - The mark will be rescaled accordingly to give a result out of 15 marks.

  (Type : F)

Formula Sheet

- Horizontal Asymptote
$$\lim_{x\to\infty} f(x)$$

- Maclaurin Series
$$f(0) + f'(0) + \frac{f''(0)}{2!} + \frac{f''(0)}{2!} + \frac{f'''(0)}{3!} + \ldots$$

(i) (2 Marks) Suppose the general term u_n is given as

$$u_n = \frac{3^n}{n!}.$$

State u_{n+1} and hence calculate a simplified expression for r, where

$$r = \frac{u_{n+1}}{u_n}$$

(ii) (2 Mark) Given the function $g(x) = \sqrt{x - 3}$ find the inverse of the function $g^{-1}(x)$.

(iii) (2 Marks) You are given the following functions $g(x)$ and $f(x)$:

$$g(x) = x^2 - 2x + 1$$

$$f(x) = \sqrt{x-1}$$

Determine the values of $f \circ g(3)$ and $g \circ f(3)$. Show your workings.

(*You can express any relevant answers as square root terms .i.e. in form "$\sqrt{a}$" where a is some integer.*)

(iv) (2 Mark) Find the domain and the range of the function:

$$f(x) = 5sin(x) + 5$$

(v) (3 Marks) Find the x-intercepts and the y-intercept of the following function

$$f(x) = x^2 - 6x + 5$$

(vi) (2 Marks) Determine the vertical asymptote(s) of the following function

$$y = f(x) = \frac{2x^2}{x^2 - 4}$$

(vii) (2 Marks) Determine the horizontal asymptote(s) of the following function

$$y = f(x) = \frac{2x^2}{x^2 - 4}$$