

CATHOLIC COLLEGE OF EDUCATION SYDNEY

CASTLE HILL

Semester 2

Graph Theory and Statistics

LECTURER: W. N. Franzsen

November, 1991

TIME ALLOWED: 2 hours, plus 10 minutes reading time

INSTRUCTIONS TO STUDENTS

There are 6 questions on 2 pages. You may attempt any and all questions. I expect that the correct answer to 4 questions would be a very good result. Do not spend too long on any of the harder questions.

1. Write down the general solution to each of the following difference equations.

(a) $x_n = 0.03x_{n-2}$

(b) $x_{n-3} = 2x_{n-4}$

(c) $x_n = x_{n-1} + 2x_{n-2}$

(d) $x_n = x_{n-1}$

2. Write down the general solution to this difference equation and hence find the particular solution given that $x_0 = 1$ and $x_2 = 3$,

$$x_{n+1} = 5x_n - 14x_{n-1}.$$

3. Sketch

$$f(x) = \sqrt{x+1}, \quad \text{for } x \geq -1.$$

Is f a function?

4. Find all the stationary points, and their nature, for the function

$$g(x) = \frac{x^2}{e^x}$$

and hence sketch the curve.

5. Sketch the curve

$$y = \frac{x^2 - x - 1}{x + 2},$$

showing all asymptotes.

6. In 1980 the population of a species of mammal was 14325, studies over the next ten years showed that the population satisfied the difference equation

$$x_{n+1} - x_n + 0.21 = 0.$$

If the population was 5821 in 1989, find an equation that describes the population.

Is this an endangered species? That is, will the species die out?

In 1991 the parks commission decided to release n animals into the wild from zoos. How many will they need to release each year if the population is to:

- (a) Survive? (If you think they are dying out) or
- (b) increase to 10 000 within 3 years?