DEPARTMENT OF MATHEMATICS $\boxed{fO6}$
UNIVERSITY OF MANITOBA

FA/MATH 1020 Math In Art, Mid-Term Exam, 2006

Examiners

Dr. R. Padmanabhan, Mathematics

Professor David Lucas, School of Art

LAST NAME: (Print in ink) _____

FIRST NAME; (Print in ink)_____

STUDENT NUMBER: _____

FACULTY: School of Art   Science   University One

SIGNATURE:_____
           (II understand that cheating is a serious offence)

Please show your work clearly.

Calculators are permitted.

Drawing instruments like ruler, compass, protractors are allowed.

Cell phones or other aids are not allowed.

The exam has a total of 6 pages (including this title page) and two blank sheets for rough work. Please check that you have all the pages.

There are 6 questions and each question carries 10 points. The total value of all question is 60.

Please do not write in this column
1. _____/10
2. _____/10
3. _____/10
4. _____/10
5. _____/10
6. _____/10
Totsl _____/60

FA/MATH 102- Mathematics in Art
Mid-Term Test, 19 October, 2006

1. In each of the following, numbers in the first column indicate the lengths of the three sides of a triangle. Determine the list of properties that are valid for the triangle in question.

triangle with sides a, b, c	equilateral triangle	isosceles triangle	golden triangle	right-angled triangle	no such triangle exists
5, 12, 13					
5, 5, 5					
5, 2, 2					
$1+\sqrt{5}$, 2, 2					
3, 3, $\sqrt{18}$					

10

2. Divide the given segment AB (of length 12 cm) into seven equal parts by using ruler and compass. Measure the actual length 12/7 that you have obtained with a marked ruler. Also, obtain the value of 12/7 (i.e.12÷7) using a calculator and compare the two values.

A ———————————————————————— B

3.   If ▢ ABCD is a *golden recangle* with the <u>shorter side</u> AB = 11 cm, what is the approximate size of the longer side CD?
Draw such a rectangle in the space given below and subdivide it into a square and a smaller golden rectangle. Iterate this process as much as you can (say, at least four times) .
Using the technique (of drawing with circular arcs) we saw in the class, draw a smooth spiral within the golden rectangle ABCD.   10
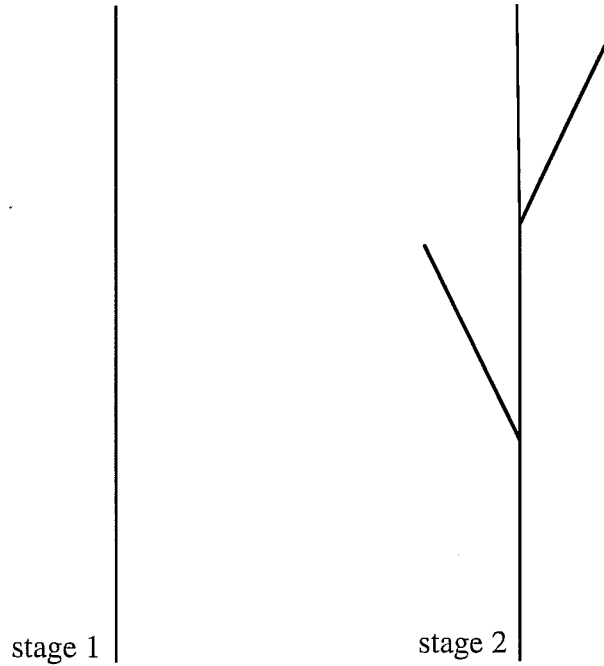
FA/MATH 102- Mathematics in Art
Mid-Term Test, 19 October, 2006

4. Study the algorithm given by the first three stages of a fractal tree shown below and draw the next two stages of the fractal. Demonstrate self-similarity by circling a portion of your final sketch which is similar the entire tree in the previous stage.
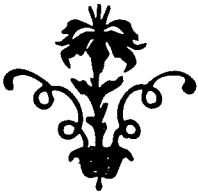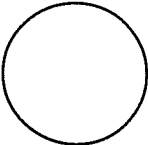
10

stage 1

stage 2

5 (a) Three points given below lie on a circle but unfortunately the circle itself got erased. Reconstruct the complete circle using the ruler and compass techniques. Locate the centre of the circle and determine the value of the radius of the circle.   4

5 (b). List the symmetries of each of the following designs. Use the notation refl λ (for mirror reflection about the line λ), rot(C, θ) (for rotational symmery with centre C in degrees θ counterclockwise. Mention the total number of symmetries for each of the designs   6

Design	symmetries	total number of symmetries

6. You are commissioned to construct an obtuse golden triangle ABC using copper wire. If the total length of the wire is 7336 feet, what is the base BC of the largest golden triangle that you can construct?