MATH/FA 1020 – Math in Art

Summer 2016

Worksheet 3

Deadline:

If you are submitting this for bonus (Summer 2016 - A01 *only*), it is due on June 3rd, 2016.

Objective:

The objective of this worksheet is to explore fractals and (linear) perspective drawings. All construction lines should still be visible on the page, but should be fainter that the objects you are drawing. You are encouraged to use (translucent) colour to accentuate the objects.

1. Start with a line (make a fairly long line along one side of the page, halfway between the edge and the middle). This line is Step 1. Construct the two lines that form a right angle isosceles triangle having the line from Step 1 as the hypotenuse. These two lines are now Step 2 (Step 1 is now ignored). Repeat the process of replacing the lines from the previous step with the two sides of a $45°$- $45°$- $90°$ triangle, alternating sides of the previous curve. Create at least 6 steps of this iterative fractal.

   You may use a set square or protractor to speed up the process after the first construction. This fractal is called the dragon curve, it is well known so doing an internet search may help.

2. Start with a large square. This is Step 1. Find (construct) the points that are the midpoints of the sides of the square and join them (forming another square). This is Step 2 (this step contains two squares now). Repeat the iterative process until you have at least 8 squares. Use colour to accentuate the fractal properties of this object.

3. Draw (lightly) a line down the middle of the page. Find the midpoint of the line and draw a circle centred at this point, having this line as diameter. This is Step 1. Now using the midpoints of the segments from the centre to the end of the line, and draw the two circles half the size of the circle from Step 1. This is Step 2 (this step contains three circles, one large and two half size). Continue this process for 6 steps. You should be able to do at least the first 4 steps with a compass, turn to hand drawing only when the circles are too small for the compass.

4. Draw a (rectangular) room in one point perspective, done in such a way that the vanishing point is on the inside of the opening to the room. Decorate the room with rectangular items. (For example: a rug, a coffee table, window, wall hanings, etc.)

5. Draw a rectangular box in one point perspective, done in such a way that the vanishing point is on the outside of the rectangle representing the side of the box closest to the drawing plane.

6. (Best drawn in landscape.) Draw a horizontal line (horizon) on the page. Pick two points on the line to be VP_1 and VP_2. Draw several (minimum 3) rectangular boxes in two point perspective, using VP_1 and VP_2 as the two vanishing points. Draw them so that they are **completely below** the horizon (or completely above the horizon).

7. (Best drawn in landscape.) Draw a horizontal line (horizon) on the page. Pick two points on the line to be VP_1 and VP_2. Draw several (minimum 3) rectangular boxes in two point perspective, using VP_1 and VP_2 as the two vanishing points. Draw them so that the **horizon runs** through the boxes.

8. Pick three points on the page to be vanishing points VP_1, VP_2, and VP_3. (These points cannot all be in a line, they should form a fairly large triangle on the page.) Draw several (minimum 3) rectangular boxes in three point perspective.

9. (Best drawn in landscape.) Draw a horizontal line (horizon) on the page. Pick two points on the line to be VP_1 and VP_2. Draw a large square in two point perspective. Divide this square into 16 equally sized smaller squares (a 4×4 grid).

   Draw a (normal) square and form a 4×4 grid in the square. Draw some picture (simple line drawing) in the (normal) square and use the grid as a guide to morph the image onto the perspective grid.

10. (Variations on a theme) Using concentric circles and lines radiating from their centre, create a circular grid. Morph your grid drawing onto the circular grid. (You could use the upper half circles and lines $45°$ apart, or perhaps closer than $45°$. Do not draw to the centre, but imagine the smallest circle being the bottom edge of the original drawing.)