Exam 1
Math 2113

Name:

Show *all* your work on the following. A right answer with no supporting work will receive no credit.

1. Determine whether the statement is *always* true, *sometimes* true, or *never* true. If you believe it is never true or always true, justify your answer (citing a theorem or a formula from the book does not suffice). If it is sometimes true provide an example when it is true and an example when it is not true.

   (a) [4] Two lines that never intersect are parallel.

   (b) [4] Vertical angles are supplementary.

   (c) [4] An equilateral triangle is isosceles.

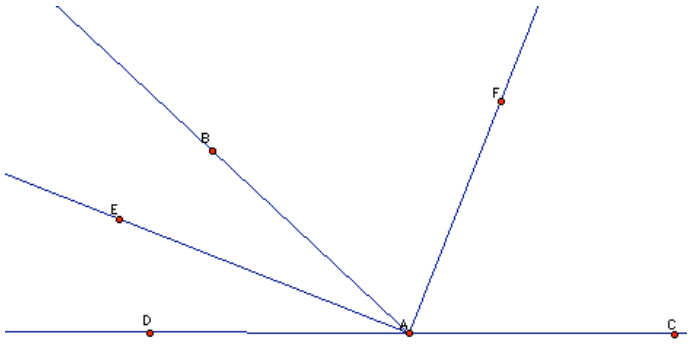
   (d) [4] A network with four odd vertices is a traversable network.

2. Consider a correctly set clock that stars ticking at noon and answer the following:

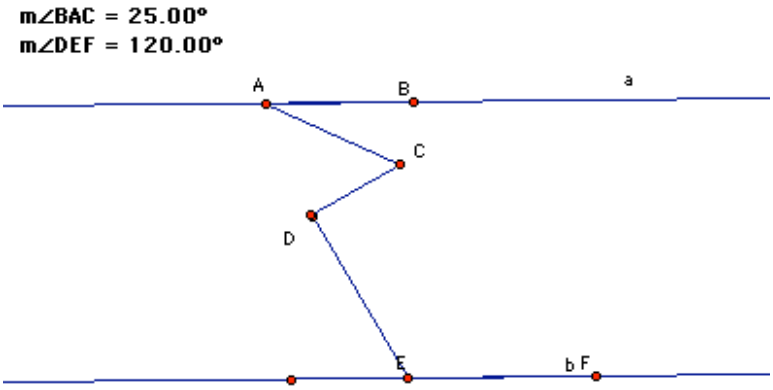
   (a) [6] Find the measure of the angle swept by the hour hand by the time it reaches 6:50 pm.

   (b) [8] What is the first time after noon when the hour and minute hands form 90°?

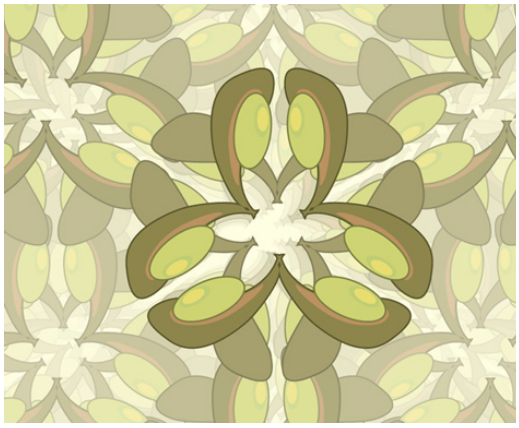
3. [5] The following was constructed by selecting a point A on the horizontal line and then choosing an arbitrary point B not on the line to construct the ray passing through A and B. The remaining rays $\overrightarrow{AE}$ and $\overrightarrow{AF}$ bisected angles DAB and BAC respectively. Prove the measure of the angle EAF is 90°.



4. [4] Given that the lines a and b are parallel and that CDE is a right angle, find the measure of angle ACD.



5. For the following questions refer to the figure to the right



   (a) [2] Mark any "*" points where multiple mirrors meet.

   (b) [2] Mark any points of rotation.

   (c) [2] Find the signature for the figure. (You might make use of the following tables to verify you recorded all of the symmetries:)

Red Symbol:	*	2	3	4	5	$\cdots$	N
Cost:	1	$\frac{1}{4}$	$\frac{2}{6}$	$\frac{3}{8}$	$\frac{4}{10}$	$\cdots$	$\frac{N-1}{2N}$

Blue Symbol:	2	3	4	5	6	$\cdots$	N
Cost	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{5}{6}$	$\cdots$	$\frac{N-1}{N}$

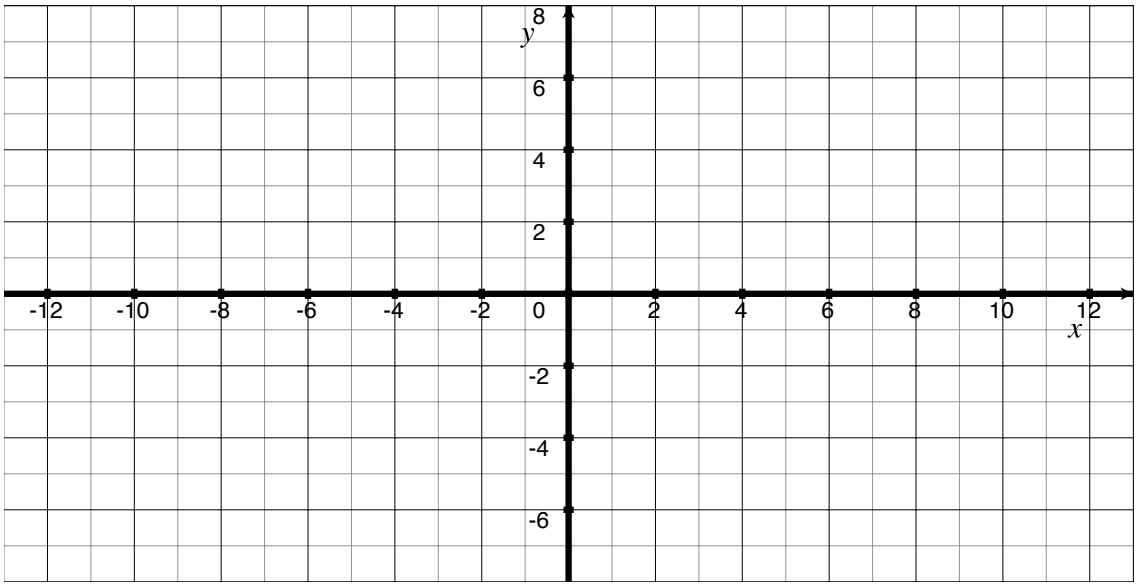
6. (a) [2] Draw a prism with a square base.

(b) [3] How many faces are on a prism with an n-gon as a base? Why?

(c) [3] How many vertices are on a prism with an n-gon as a base? Why?

(d) [4] Recall Euler's formula: The number of vertices-the number of edges+the number of faces in a closed polyhedron is 2. Use this and parts b) and c) to find the number of edges in a prism with an n-gon as a base.

7. [2] Plot a triangle with vertices A, B, and C at $(2, -2)$, $(3, 4)$, and $(8, 1)$ respectively.



   (a) [2] Draw the image of the triangle ABC under the translation:

$$(x, y) \to (x - 2, y + 3).$$

   (b) [3] Draw the image of the triangle ABC under the rotation about the origin by $-90°$.

   (c) [3] Draw the image of the above triangle under a reflection across the x-axis.

8. [8] *Explain* why a size transformation with a center at $(0, 0)$ and a scale factor of r sends (x, y) to (rx, ry).