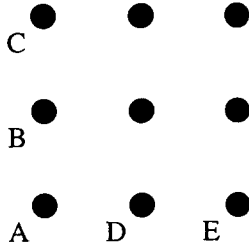


Math 131 Midterm

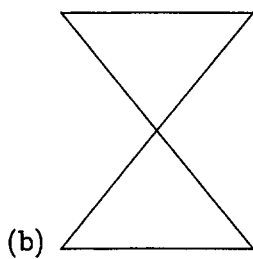
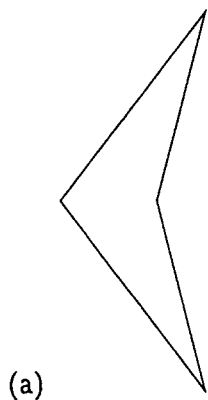
Name: _____

1. In modified taxicab geometry, you're still only allowed to travel in one of the four cardinal directions (North, South, East and West) when measuring distances. While the distance you go traveling North or South is the same, the distance between points when traveling East or West is double what it normally is. So for example, in the picture below the distance between points A and B is one unit, between A and C is 2 units but the distance between A and D is 2 units and the distance between A and E is 4 units.



- (a) (10 points) Describe what a modified taxicab circle looks like.
- (b) (10 points) What is pi in modified taxicab geometry? Justify your answer.
- (c) (10 points) What is the area of a modified taxicab circle? Justify your answer.

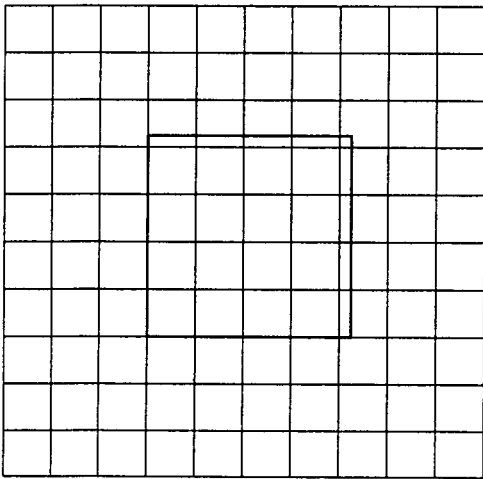
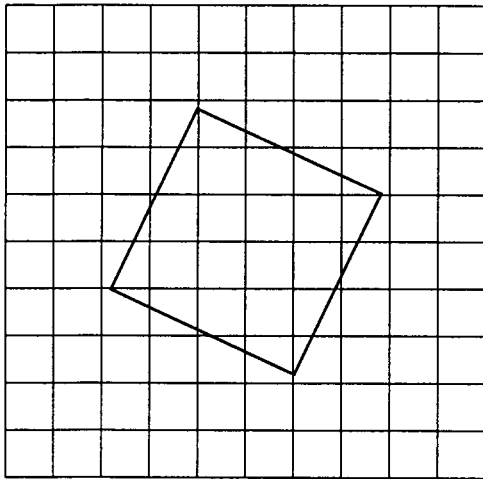
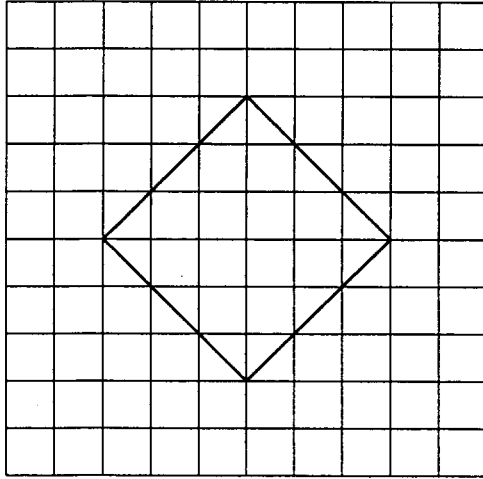
2. (4 points per figure) If we define a *Toroid* as a geometric figure consisting of two pairs of congruent line segments, are the following figures toroids? Justify your answer.

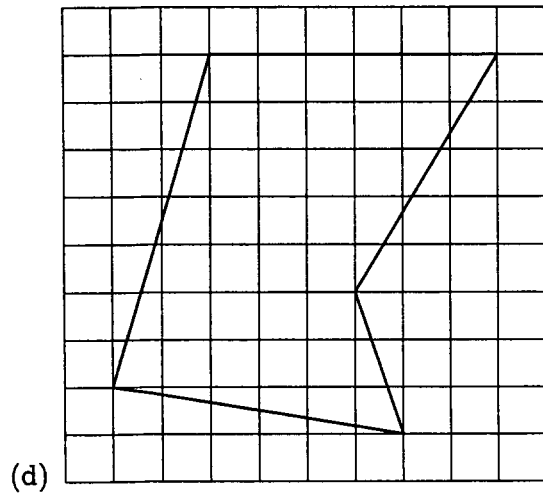


3. (4 points) Is a square a kite? Why or why not?

4. (10 points) Justify the formula for the (Euclidean) area of a rectangle using our definition of (Euclidean) area.

5. (5 points per figure) Find the perimeter and area of the following shapes in taxicab geometry (estimate when necessary). Explain how you got your answers.





6. (4 points) Determine if the following statement is true or false. Justify your answer:
If each point on a line is colored either red, blue, or green, then any segment of the line contains two points of the same color.

7. (4 points) Aaron measures the area of his floor and gets 450. Bret measures the area of his floor and gets 500. Who has a bigger room?

8. (10 points) One of your students claims that she can find the area of a rhombus by multiplying the length of a side by itself. Will the student's algorithm work for any rhombus? Explain either how you know the student's method will work or how you know it won't work (for any rhombus).

9. (a) (5 points) Draw two figures with equal areas but different perimeters. Explain how you know these figures have equal areas but different perimeters.

(b) (5 points) Draw two figures with equal perimeters but different areas. Explain how you know these figures have equal perimeters but different areas.