

CS 324E Elements of Computer Graphics

Fall 2002

Midterm

NAME:

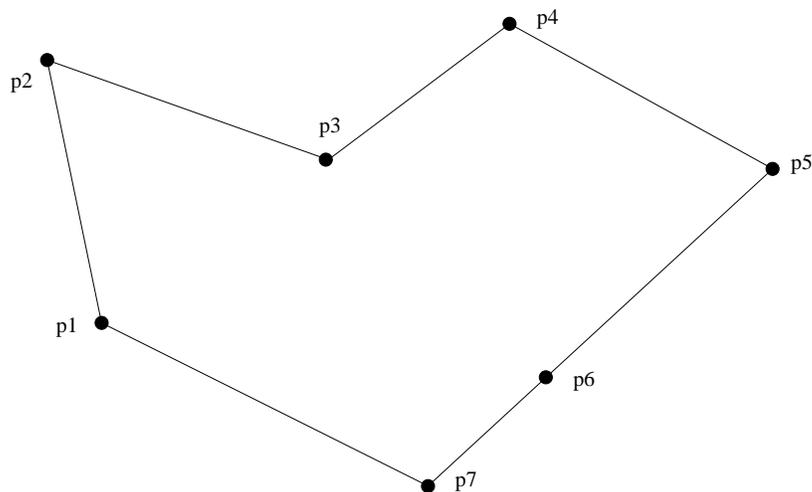
Please write your answers on THESE SHEETS. If you must turn in extra sheets, put your name on each one of them. You should not need substantial space beyond that provided here, but you should definitely show your work since partial credit will be given where appropriate.

Give short (one to two sentence) explanations for each answer. These could help you get partial credit in cases where you have given what would otherwise be considered a wrong answer. If an explanation is specifically asked for, you must give it in order to get credit for the problem.

If you do calculations to get an answer, CIRCLE the answer so that I won't fail to find it.

1. (10pts) For the points **p1**, **p2**, **p3**, **p4**, **p5**, **p6** and **p7** shown below, sketch the **GeneralPath** defined by the following code fragment. Be sure to indicate clearly any sharp corners and places where the curve passes through one of the points that may occur.

```
Point2D.Float p1,p2,p3,p4,p5,p6,p7;  
GeneralPath path = new GeneralPath();  
path.moveTo(p1);  
path.quadTo(p2,p3);  
path.curveTo(p4,p5,p6);  
path.quadTo(p7,p1);
```

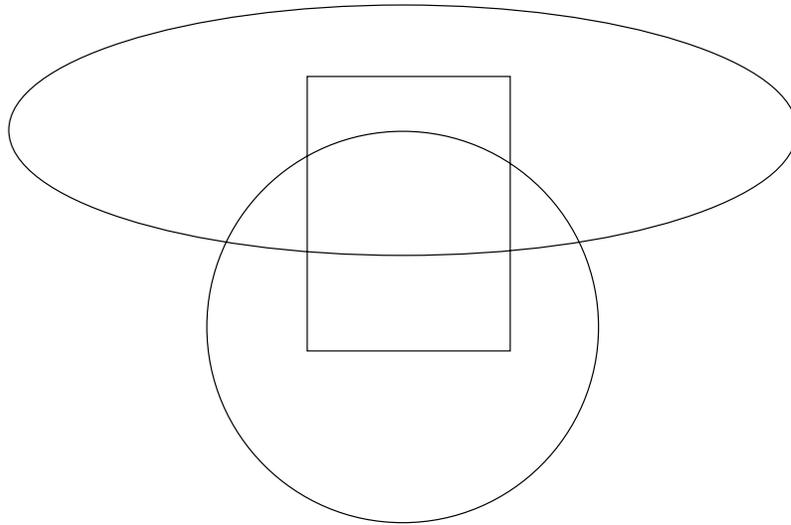


2. (10 pts) Which of the following classes implements the **Shape** interface? Circle all that apply.

- a) Ellipse2D
- b) Area
- c) Stroke
- d) AffineTransform
- e) GeneralPath
- f) Color

3. (10 pts) An application defines three **Shapes**, a **rectangle**, a **circle** and an **ellipse** as shown below. In the picture, color the region that will be **Area c** after executing the following CAG code fragment.

```
Area c = new Area(circle);  
Area r = new Area(rectangle);  
Area e = new Area(ellipse);  
e.intersect(c);  
c.intersect(r);  
c.add(e);
```



4. (10 pts) For each of the following colors given in RGB format, give a short (but at least two word) description of the color (e.g. “light blue”, “bright red”, “burnt orange”, etc.).
- a) (0,80,0)
 - b) (255,255,0)
 - c) (200,100,200)
 - d) (200,0,100)
 - e) (150,150,150)
5. (5 pts) True or False. When using TexturePaint to draw an image as the background for an animation, it is necessary to use double buffering since the Graphics must be erased before drawing the next frame. Explain your answer.
6. (5 pts) True or False. Calling repaint() from inside the paint() method will put your application into an infinite loop. Explain your answer.

7. (10 pts) Consider the following simple application.

```
public class drawShape extends ApplicationFrame {
    Shape myShape;
    public drawShape() {
        GeneralPath myShape = new GeneralPath();
    }
    public void paint(Graphics g) {
        Graphics2d g2 = Graphics g;
        g2.fill(myShape);
    }
    public static void main(String[] args) {
        new drawShape();
    }
}
```

Which of the following is true.

- a) The class will not compile.
- b) The class will compile, but will not run.
- c) The class will compile and run, but will not draw anything.
- d) The class will compile, run, and draw something.

8. (10 pts) A wall in a rather crazy variant of Pong has a normal vector of $(1,1)$. If you forget to normalize this vector before using it to calculate the reflection vector direction, what will happen?

- a) The ball will pass through the wall.
- b) The ball will stop when it hits the wall.
- c) The ball will slow down when it bounces off the wall.
- d) The ball will speed up when it bounces off the wall.
- e) The ball will bounce in the wrong direction off the wall.
- f) The ball will bounce back in the direction it came.

9. (10 pts) You are implementing a moving Rocket for a game you are working on. The Rocket is defined with the origin (0,0) at its center, facing to the right, and you are moving it using affine transforms in the `timeStep()` method shown below, which is called from within an infinite loop in the `run()` method of a Thread as in our AnimationFrame.

```
// Instance Variables
    Shape Rocket;
    AffineTransform xform;
    ....
public void timeStep() {
    xform.rotate(Math.pi/100);
    xform.translate(5,0);
    xRocket = xform.createTransformedShape(Rocket);
}
```

Which of the following describes the motion of the rocket at each timestep? You may use a sketch or give a short explanation if you think it would help.

- a) The rocket does not move.
- b) The rocket moves continuously to the right, nose forward.
- c) The rocket moves to the right while rotating around its own center.
- d) The rocket moves in a circle of radius 5 around the origin.
- e) The rocket moves in a widening spiral path starting towards the right.

10. (10 pts) You are building a video game in which the user shoots at a missile as it roars from space toward a city (I think you should call it Missile Command). You shoot by moving the cursor over the rocket and pressing the mouse button. This is implemented by detecting whether or not the cursor is over the rocket when the button is pressed, and, if so, setting a variable `hit` to true. We'll then replace the drawing of the rocket with a drawing of an exploding rocket before `paint()`ing the scene if `hit` is true. The `MousePressed()` method can be used to do this detection and setting of the `hit` variable. Write the code to do these two things in the space provided. Assume that the `Rocket` is in its correct, transformed position in the window at the time this code is executed.

```
.....
// Instance Variables
Shape Rocket;
boolean hit = false;
.....
public void MousePressed(MouseEvent me) {

}
}
```

11. (10 pts) You have two Java2D applications. One of them is an interactive game. The other draws a very detailed static image of a complex scene. For each application, provide a decision, with justification, for whether or not to use anti-aliasing.