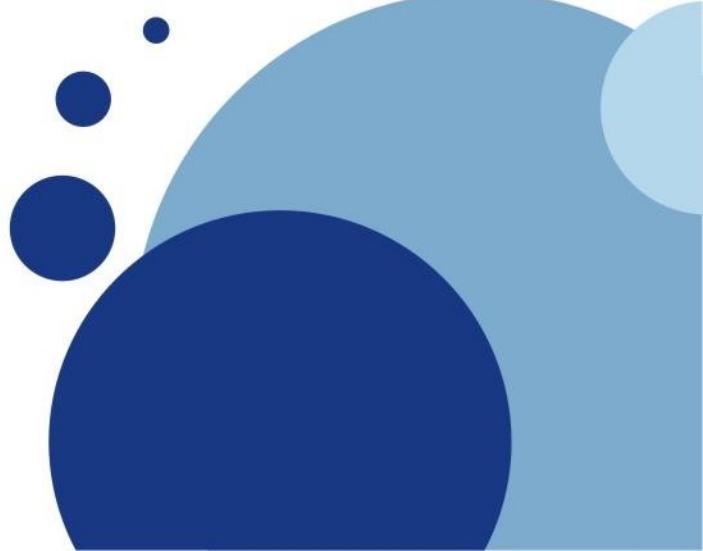


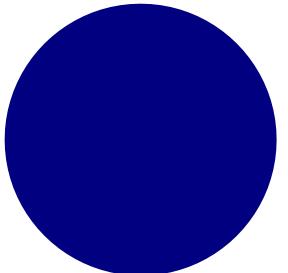
GEOG 178/258

Week 9:

Serialization and Planar Graphs

mike johnson





Telling Java an Object should be serializable

Week

9

Part 1

```
import java.io.Serializable;  
  
public class Point implements Serializable {  
    private double x, y;  
    private String name;  
    private boolean visited = false;
```

```
>import java.awt.Color;  
  
public class Polyline implements Serializable {  
    // Define a arrayList which stores the point class objects  
    private ArrayList<Point> points;  
  
    // Define a boolean which stores whether or not the polyline is closed  
    private boolean closed = false;
```

Initializing a Menu

Week

9

Part 1

```
public GUI() throws IOException, URISyntaxException {
    // Feel free to ignore, this just calls the constructor of JPanel to enable DoubleBuffering to avoid flickering.
    super(true);

    // You always need a frame to place other components such as panels or buttons
    frame = new JFrame("TinyGIS");
    frame.setDefaultCloseOperation(JFrame.DO_NOTHING_ON_CLOSE); // Taken care of by event handler instead
    frame.add(this);

    // Register the gui to listen to mouse events
    this.addMouseListener(this);
    this.addMouseMotionListener(this);

    // Set the (preferred) size of the panel
    setPreferredSize(new Dimension(699,446));

    // Load background image
    if (basemap == null) basemap = ImageIO.read(new File(TinyGIS.class.getResource("basemap.png").toURI()));

    // Create menu bar
    JMenuBar menuBar      = new JMenuBar();

    // Create file menu
    JMenu fileMenu        = new JMenu("File");
    openMenuItem         = new JMenuItem("Open...");
    saveMenuItem         = new JMenuItem("Save");
    saveAsMenuItem       = new JMenuItem("Save As...");
    saveMenuItem.setEnabled(false);
    menuBar.add(fileMenu);
    fileMenu.add(openMenuItem);
    fileMenu.add(new JSeparator());
    fileMenu.add(saveMenuItem);
    fileMenu.add(saveAsMenuItem);
    openMenuItem.addActionListener(this);
    saveMenuItem.addActionListener(this);
    saveAsMenuItem.addActionListener(this);
```

1. Create a Menu bar
2. Add Options...
3. Enabled false
4. Add fileMenu to bar
5. Add options to fileMenu
6. Set actionListeners

Defining File Open

```
// a button was pressed
public void actionPerformed(ActionEvent e) {
    if (e.getSource() == openMenuItem) {
        System.out.println("User initiated open function.");

        JFileChooser fileChooser = new JFileChooser();
        fileChooser.setDialogTitle("Open");
        int fileChooserResult = fileChooser.showOpenDialog(frame);

        if (fileChooserResult == JFileChooser.APPROVE_OPTION) {
            File openPath = fileChooser.getSelectedFile();

            try {
                FileInputStream fileIn = new FileInputStream(openPath.getAbsolutePath());
                ObjectInputStream objIn = new ObjectInputStream(fileIn);

                saveFile = (SaveFile) objIn.readObject();
                pp = saveFile.getPp();
                pl = saveFile.getPl();

                objIn.close();
                fileIn.close();

                saveFilePath = openPath.getAbsolutePath();
                saveMenuItem.setEnabled(true);
                fileSaved();

                repaint();

                System.out.println("Opened file: " + saveFilePath);
            } catch (FileNotFoundException i) {
                System.out.println("Open failed!");
                JOptionPane.showMessageDialog(frame, "Could not find a file!", "No File Found", JOptionPane.ERROR_MESSAGE);
            } catch (IOException i) {
                System.out.println("Open failed!");
                JOptionPane.showMessageDialog(frame, "The file you selected is not compatible with TinyGIS.", "Invalid File", JOptionPane.ERROR_MESSAGE);
            } catch (ClassNotFoundException i) {
                System.out.println("Open failed!");
                JOptionPane.showMessageDialog(frame, "The file you selected is not compatible with TinyGIS.", "Invalid File", JOptionPane.ERROR_MESSAGE);
            }
        } else {
            System.out.println("Open aborted!");
        }
    }
}
```

Saving a File

```
 } else if (e.getSource() == saveAsMenuItem) {  
    System.out.println("User initiated save as function.");  
  
    JFileChooser fileChooser = new JFileChooser();  
    fileChooser.setDialogTitle("Save As");  
    File file = new File(System.getProperty("user.home") + java.io.File.separator + "MyData.tgis");  
    fileChooser.setSelectedFile(file);  
    int fileChooserResult = fileChooser.showSaveDialog(frame);  
  
    if (fileChooserResult == JFileChooser.APPROVE_OPTION) {  
        File savePath = fileChooser.getSelectedFile();  
  
        try {  
            FileOutputStream fileOut = new FileOutputStream(savePath.getAbsolutePath());  
            ObjectOutputStream objOut = new ObjectOutputStream(fileOut);  
  
            saveFile = new SaveFile(pp, pl);  
            objOut.writeObject(saveFile);  
  
            objOut.close();  
            fileOut.close();  
  
            saveFilePath = savePath.getAbsolutePath();  
            saveMenuItem.setEnabled(true);  
            fileSaved();  
  
            System.out.println("Saved as file: " + saveFilePath);  
        } catch (IOException i) {  
            System.out.println("Save as failed!");  
            JOptionPane.showMessageDialog(frame, "There was an error in saving your data.", "Save Error", JOptionPane.ERROR_MESSAGE);  
        }  
    } else {  
        System.out.println("Save as aborted!");  
    }  
}
```

Sub-code (added here to save space)

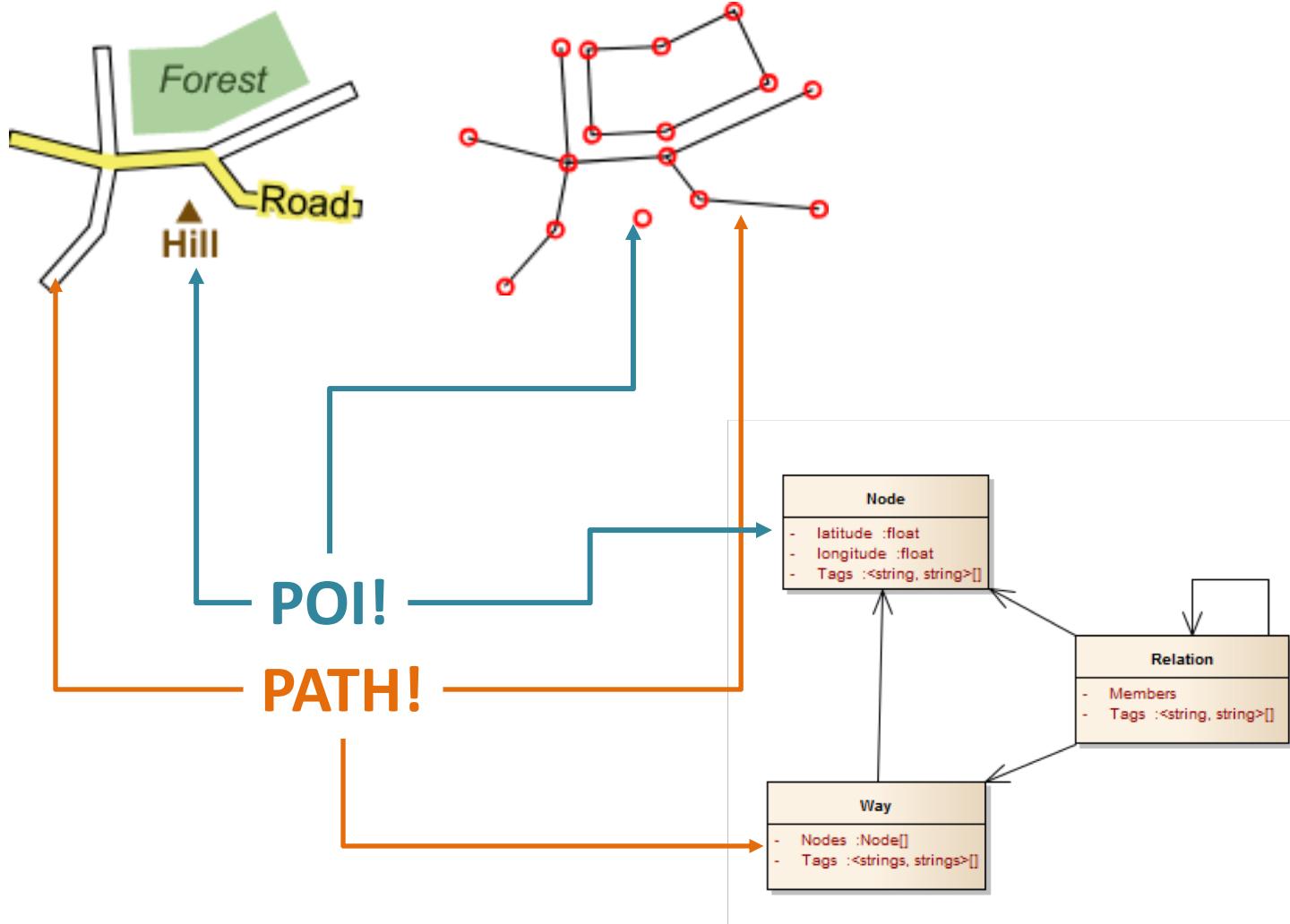
```
3 import java.io.Serializable;
4
5 public class Savefile implements Serializable {
6     private Polypoint pp;
7     private Polyline pl;
8
9     public Savefile (Polypoint pp, Polyline pl) {
10         this.pp      = pp;
11         this.pl      = pl;
12     }
13
14     public Polypoint getPp() {
15         return pp;
16     }
17
18     public void setPp(Polypoint pp) {
19         this.pp = pp;
20     }
21
22     public Polyline getPl() {
23         return pl;
24     }
25
26     public void setPl(Polyline pl) {
27         this.pl = pl;
28     }
29 }
```

Homework

Week

9

Part 2



OSM (Nodes)

Week

9

Part 2

OpenStreetMap Edit History Export

Search Where is this? Go

Node: The Home Depot (1672439282) ×

Fix retail.

Edited 3 months ago by [escallic](#)
Version #2 · Changeset #[65078927](#)
Location: 34.4276937, -119.8706973

Tags

addr:city	Goleta
addr:housenumber	6975
addr:postcode	93117
addr:street	Marketplace Drive
name	The Home Depot
phone	+1-805-961-4746
shop	doityourself

Download XML · View History

The Home Depot

Marketplace Drive

Storke Road

Storke & Market Place Drive

P

McDonald's

Staples

GPS Traces User Diaries Copyright Help

OSM (Ways)

Week

9

Part 2

Way: Storke Road (231846783)

Edited 4 months ago by [escalico](#)
Version #7 - Changeset #64458692

Tags

cycleway	lane
highway	secondary
lanes	5
name	Storke Road
oneway	yes
surface	asphalt
tiger:cfcc	A45
tiger:county	Santa Barbara, CA
tiger:name_base	Storke
tiger:name_type	Rd
turn:lanes	left left none none

Part of

Relation [Coast Bicycle Route](#) (6637813) (as forward)
Relation [Winchester Canyon](#) (1105800) (as forward)
Relation [UCSB \(1101228\)](#) (as forward)
Relation [Goleta \(1101224\)](#) (as forward)
Relation [UCSB Express](#) (1105825) (as forward)
Relation [SBCC/UCSB Express](#) (1101565) (as forward)

Nodes

5416803482 (part of way — Storke Road (561820425))
3771334361 (part of way — 373714167)
6058746615 (part of way — 643955894)
5416803481
5416803475 (part of way 542875436)
165341872 (part of ways — Storke Road (561820410), — Hollister Avenue (69728457), and — Hollister Avenue (70346777))

[Download XML](#) · [View History](#)

OSM Routing

Week

9

Part 2

University of California, Santa Barbara, Isla Vista

Car (OSRM) Go Reverse Directions

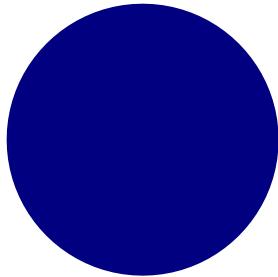
Directions

Distance: 4.1km. Time: 0:07.

1. Start on unnamed road 40m
2. Turn left onto unnamed road 50m
3. At the end of the road turn right onto Marketplace Drive 50m
4. Turn left onto Storke Road 170m
5. Turn right onto Hollister Avenue 900m
6. Turn right onto South Los Carneros Road 900m
7. Turn left onto Mesa Road 1300m
8. Turn right onto Ocean Road 400m
9. Continue on unnamed road 50m
10. At roundabout take 1st exit onto unnamed road 90m
11. Exit roundabout onto unnamed road 200m
12. Reach destination

Directions courtesy of FOSSGIS Routing Service

The map displays a detailed street layout in Santa Barbara, California. Key features include Hollister Avenue, Storke Road, and Marketplace Drive. Commercial areas are marked with icons for restaurants like Chili's, Jack In The Box, and Ca'Dario Cucina Italiana. Landmarks such as the University Chevron gas station and the Hilton Garden Inn are also visible. The map uses color coding for different land use types and includes parking symbols (P). A red box highlights a junction point between Marketplace Drive and Storke Road.



Our Job: Build a Graph of ways and nodes

Week

9

Part 2

To go from D to E

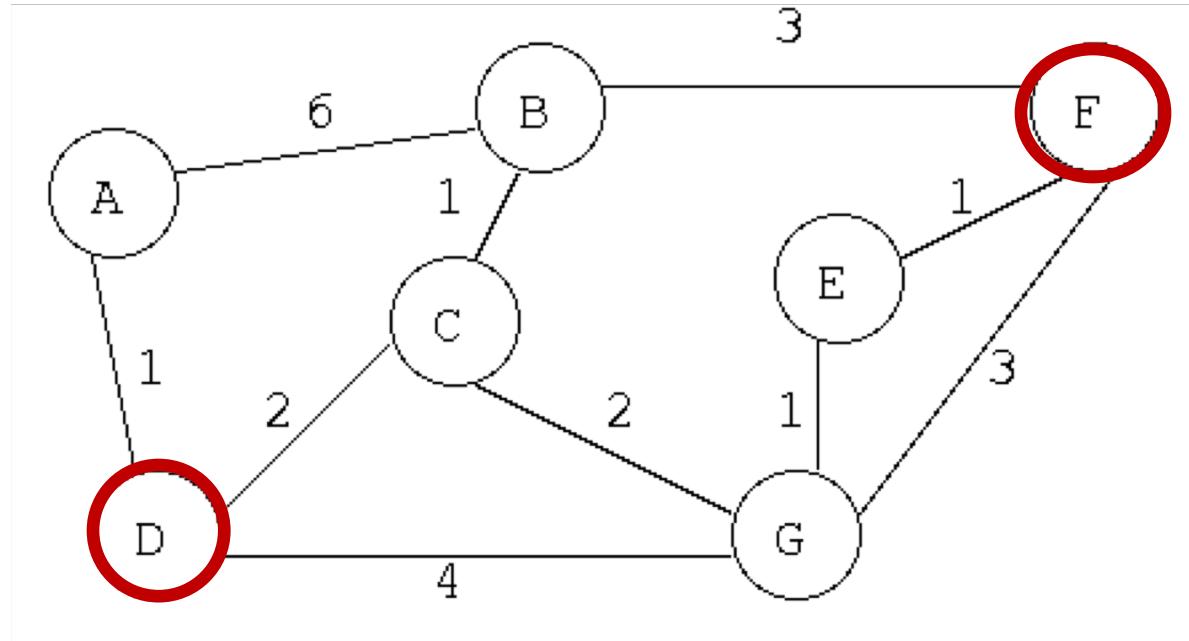
DABF = 10

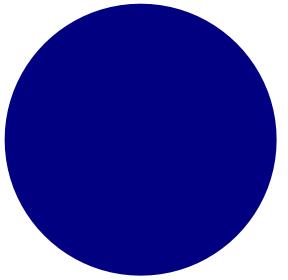
DCBF = 6

DCGEF = 6

DGF = 7

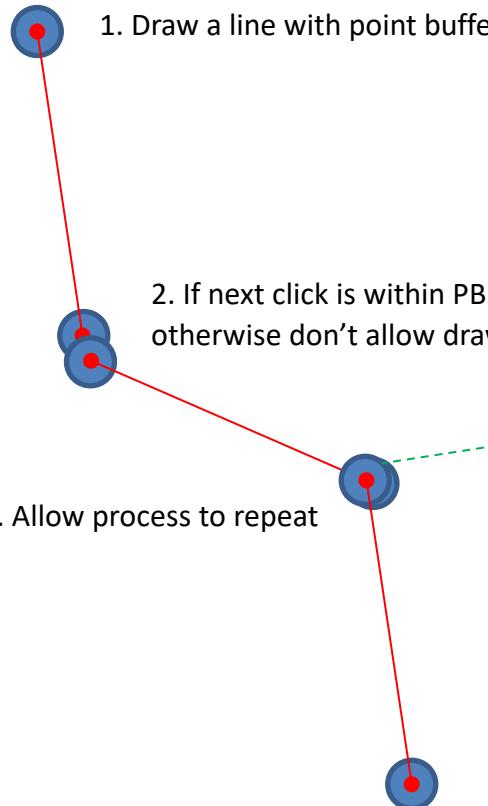
DGEF = 6





Minimum Example:

1A. Define line class (serialize?)



1. Draw a line with point buffers

2. If next click is within PB snap points,
otherwise don't allow drawing

3. Allow process to repeat

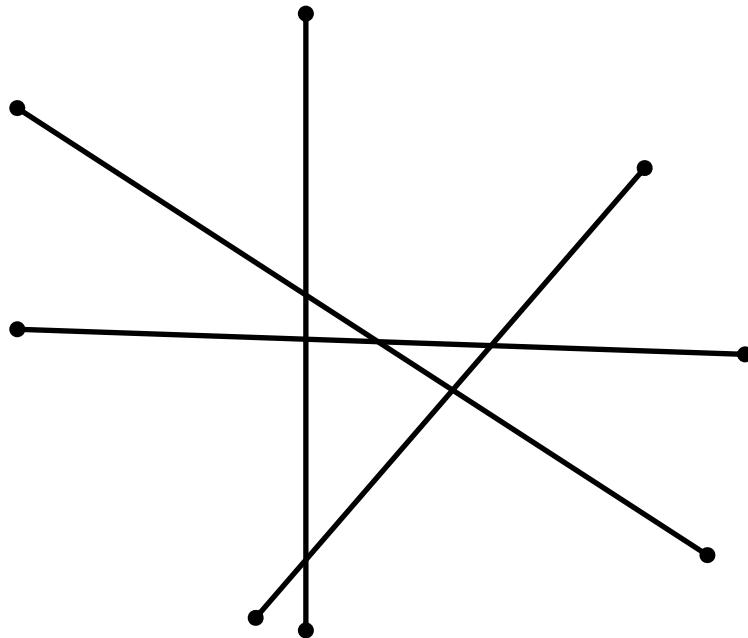
1B. Add POI *258

find nearest node and generate line

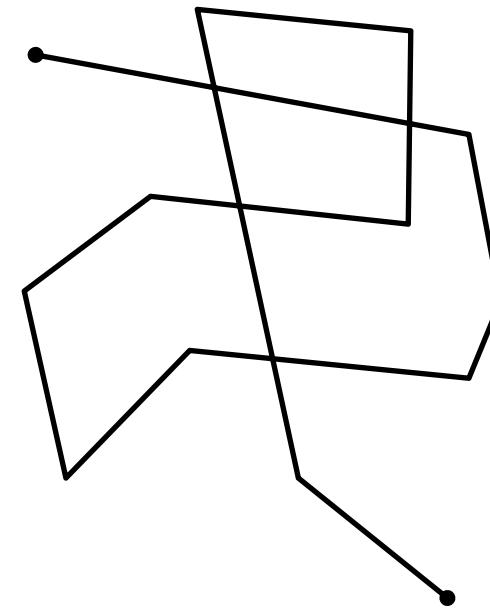


Home Depot

More Difficult: Graph from lines



*Currently: 4 line segments and 8 Points
Should be: 16 ways and 26 nodes*



*Currently: One PolyLine (13 Points)
Should be: 17 nodes, 20 ways*

Finding Intersecting Nodes

Week

9

Part 2

Forms for the Equation of a Line		
Slope-Intercept	$y = mx + b$	m is the slope b is the y -intercept
Point-Slope	$y - y_1 = m(x - x_1)$	m is the slope (x_1, y_1) is a point on the line
Standard Form	$ax + by = c$	a is positive
Intercept Form	$\frac{x}{a} + \frac{y}{b} = 1$	a is the x -intercept b is the y -intercept
Vertical	$x = a$	Vertical line with a as the x -intercept
Horizontal	$y = b$	Horizontal line with b as the y -intercept

Finding the Intersection (Theory)

Express 2 Lines:

$$\begin{array}{l} a_1X + b_1Y = C_1 \\ a_2X + b_2Y = C_2 \end{array}$$

$$\begin{bmatrix} a_1X & b_1Y \\ a_2X & b_2Y \end{bmatrix} = \begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \end{bmatrix}$$

Calculate
Determinant:

$$|A| = \begin{bmatrix} a_1 & b_1 \\ a_2 & b_2 \end{bmatrix} = (a_1*b_2 - a_2*b_1) \text{ //determinant}$$

$$A^{-1} = \frac{1}{|A|} \begin{bmatrix} b_2 & -b_1 \\ -a_2 & a_1 \end{bmatrix}$$

Re-order
Equations:

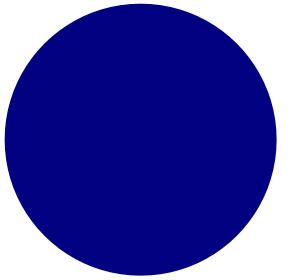
$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{|A|} \begin{bmatrix} b_2 & -b_1 \\ -a_2 & a_1 \end{bmatrix} \begin{bmatrix} C_1 \\ C_2 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{|A|} \begin{bmatrix} b_2C_1 & -b_1C_2 \\ -a_2C_1 & a_1C_2 \end{bmatrix}$$

Solve for X, Y:

$$\begin{aligned} X &= (b_2C_1 - b_1C_2) / (a_1*b_2 - a_2*b_1) \\ Y &= (a_1C_2 - a_2C_1) / (a_1*b_2 - a_2*b_1) \end{aligned}$$

new Point (x, y)



Finding the Intersection (in Java)

Solve for X, Y:

$$X = (b2*C1 - b1*C2) / (a1*b2 - a2*b1)$$

$$Y = (a1*C2 - a2*C1) / (a1*b2 - a2*b1)$$

new Point (x, y)

Where $a1 = \Delta X_{Line1}$

Where $b1 = \Delta Y_{Line1}$

Where $C1 = a1 * X_{Line1, Point1} + b1 * Y_{Line1, Point1}$

Where $a2 = \Delta X_{Line2}$

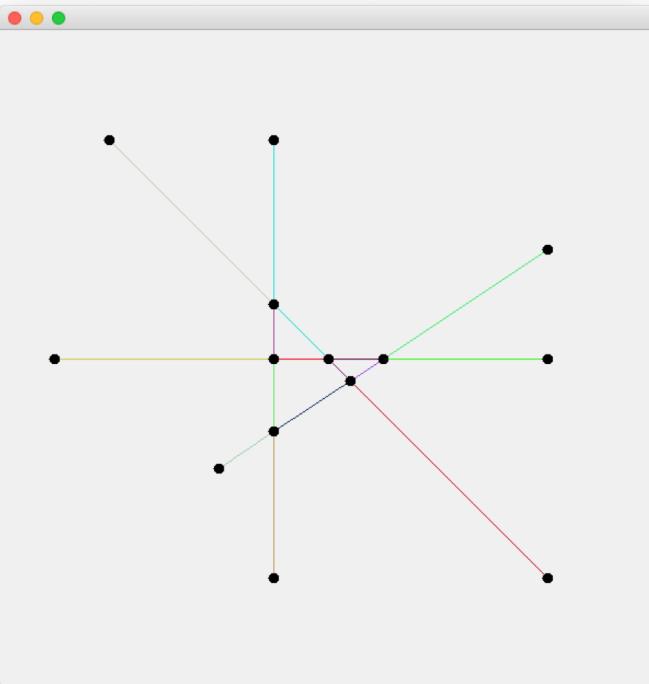
Where $b2 = \Delta Y_{Line2}$

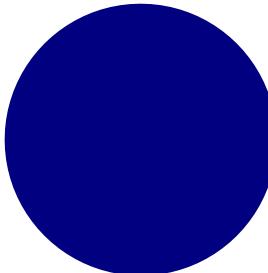
Where $C2 = a2 * X_{Line2, Point1} + b2 * Y_{Line2, Point1}$

In Class Example

```
Duplicates();
};

ldGraph() {
    = this.buildN
ew Lines();
    i < this.size
    es = new Node
    des = new Pol
    uble> dist =
        0; k < nodes
        .get(k).getLi
        odes.add(node
        int(this.get(
            0; j < tmpNo
            (oNodes.get(0
            0; t < dist.
            x = dist.inde
            ddPoint(tmpNo
            (index, Doub
            int(this.get(
                0; b < oNode
            ew Line(oNode
```





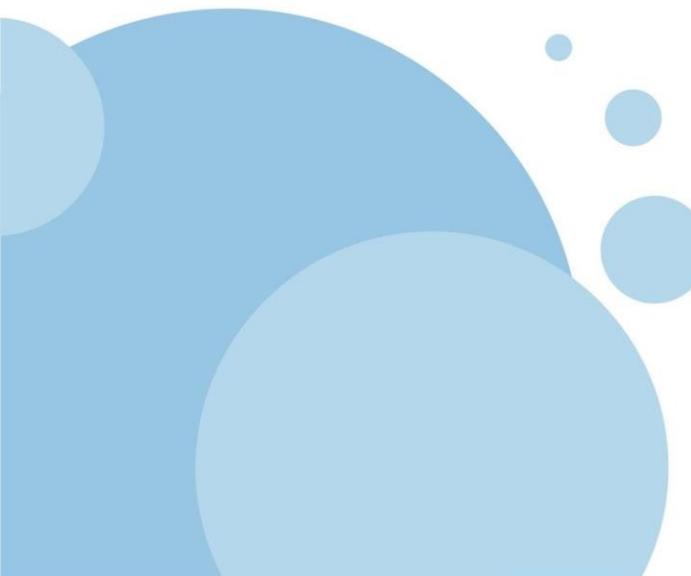
HW Hints

Week

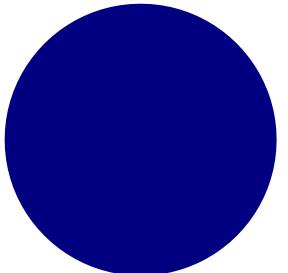
9



Homework Hints



1. Can you turn your path (polyline) into type 'Lines'
 - Should path be a class?
2. Can you create a class of 'Paths' to store multiple paths
3. Can you create buttons to execute 'build nodes' and 'build graph'



Rubric

Week

9

Rubric

GEOG 178	Points
Can I import your code w/o modification?	2
Can I create a “planar” network (classes)	2
Can I create a “planar” network (interface)	2
Can I save a network?	2
Can I read the network back in?	2

GEOG 278	Points
Can I import your code w/o modification?	2
Can I create a “planar” network (classes)	1
Can I create a “planar” network (interface)	2
Can I save a network?	1
Can I read the network back in?	2
Can I connect a POI to the network?	2