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9/21/19

Follow up on Spiral Sketches and Math

SOH CAH TOA

π

$\pi/2$

180°
 θ
 $2\pi = 360^\circ$

$3\pi/2$

π radians

$2\pi \text{ radians} = 360^\circ$

$\pi \text{ radians} = 180^\circ$

$1 \text{ radian} = \frac{180}{\pi}$

$\frac{\pi}{180 \text{ radians}} = 1 \text{ degree}$

$2\pi \text{ radians} = 360^\circ$
 $6.28 \text{ radians} = 360^\circ$

$x_1 = r_1 \cos(\theta)$
 $y_1 = r_1 \sin(\theta)$
 $x_2 = r_2 \cos(\theta)$
 $y_2 = r_2 \sin(\theta)$

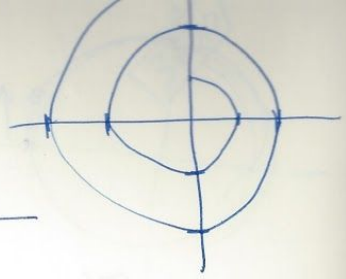
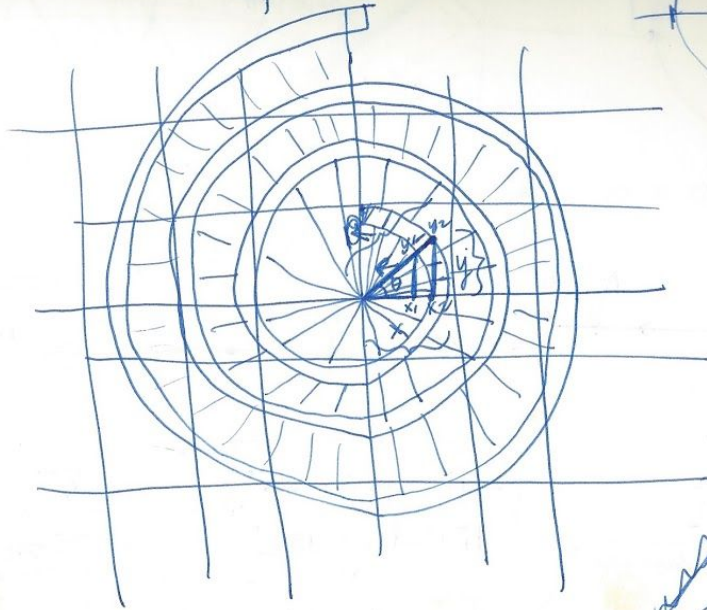
$\theta = \pi/2$

Line segment gets pushed further out.

line = (x_1, y_1, x_2, y_2)

$\frac{y}{x} = \tan \theta$
 $\arctan(y/x) = \theta$

polars coordnats:

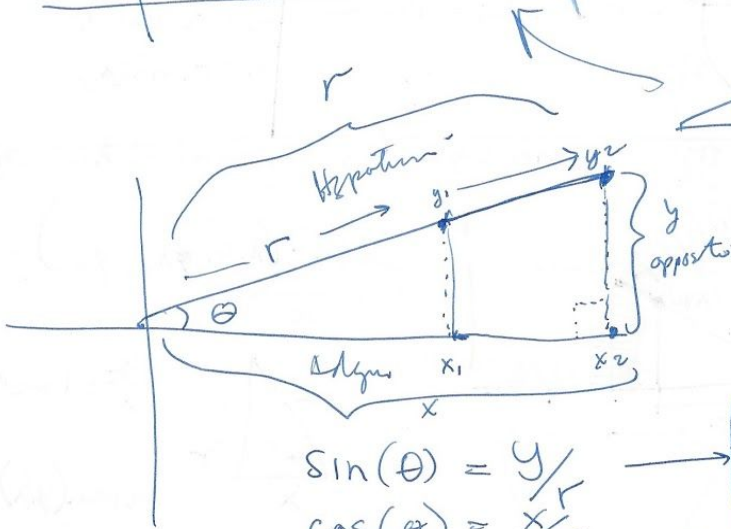
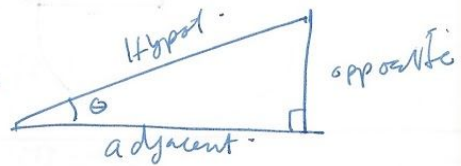
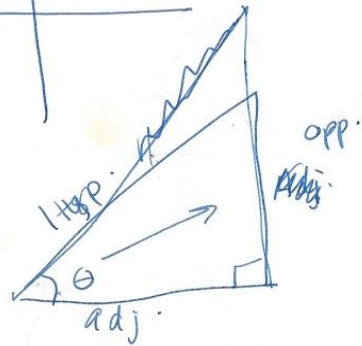


8/10

$$\sin(\theta) = \text{opp} / \text{hyp}$$

$$\cos(\theta) = \text{adj} / \text{hyp}$$

$$\tan(\theta) = \text{opp} / \text{adj}$$



$$\sin(\theta) = \frac{y}{r}$$

$$\cos(\theta) = \frac{x}{r}$$

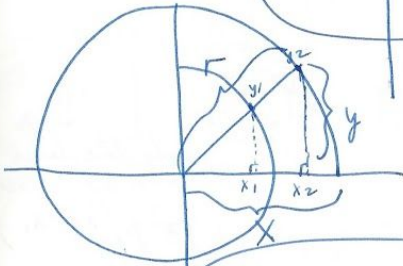
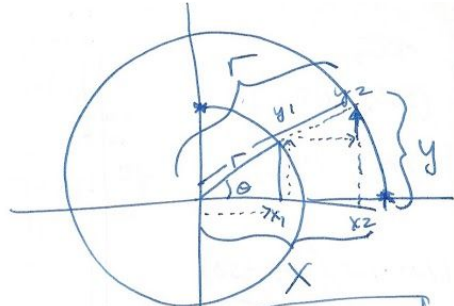
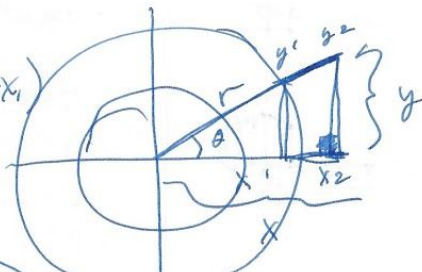
$$\tan(\theta) = \frac{y}{x}$$

$$y = r \cdot \sin(\theta)$$

$$x = r \cdot \cos(\theta)$$

Slopes

$$m = (y_2 - y_1) / (x_2 - x_1)$$

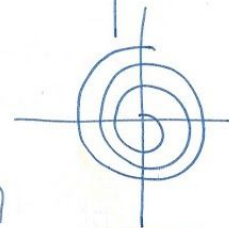
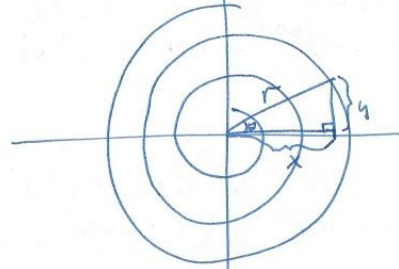
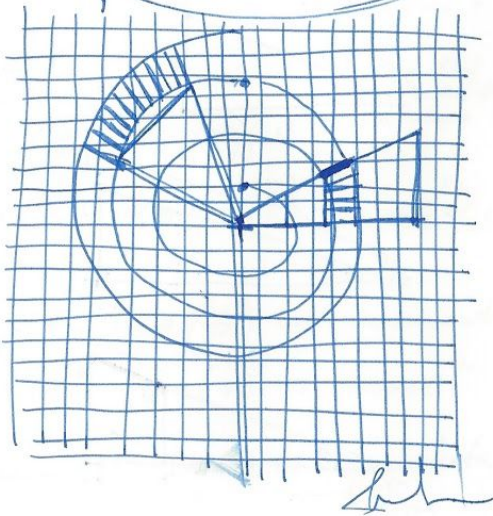


$$\begin{aligned} x &= r \cdot \cos(\theta) \\ y &= r \cdot \sin(\theta) \end{aligned}$$

$$\begin{aligned} \sin(\theta) &= y/r \\ \cos(\theta) &= x/r \end{aligned}$$

$$\begin{aligned} x &= \cos(\theta) \cdot r \\ y &= \sin(\theta) \cdot r \end{aligned}$$

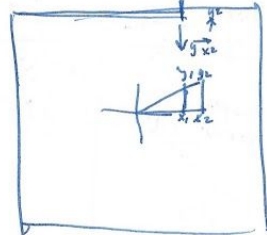
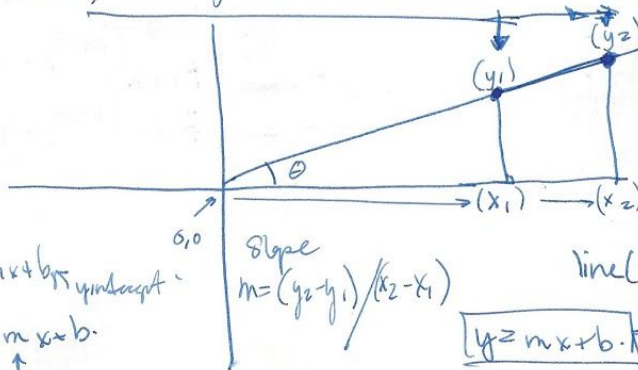
$$\begin{aligned} x &= \cos(\theta) \cdot 20 \\ y &= \sin(\theta) \cdot 20 \end{aligned}$$



$$\begin{aligned} x &= r \cdot \cos(\alpha); \rightarrow x = 50 \cdot \cos(20) \rightarrow x = 46.98 \\ y &= r \cdot \sin(\alpha); \rightarrow y = 50 \cdot \sin(20) \rightarrow y = 17.10 \end{aligned}$$

atan ??? ()

Slope = $\frac{\Delta y}{\Delta x}$



$y = mx + b$ y-intercept

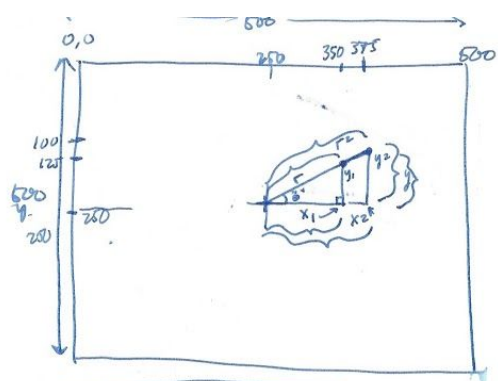
$y = m \cdot x + b$ slope

Slope $m = (y_2 - y_1) / (x_2 - x_1)$

line(x1, y1, x2, y2)

$y = m \cdot x + b$ y-intercept

$(350, 125)$
 $(375, 100)$
 $(100 - 125) / (375 - 350)$
 $-25 / 25$
Slope = -1



$(250, 250) = \text{center}$
 $r_1 = \text{radius 1}$
 $r_2 = \text{radius 2}$
 $x_1 = x_1$
 $y_1 = y_1$
 $x_2 = x_2$
 $y_2 = y_2$

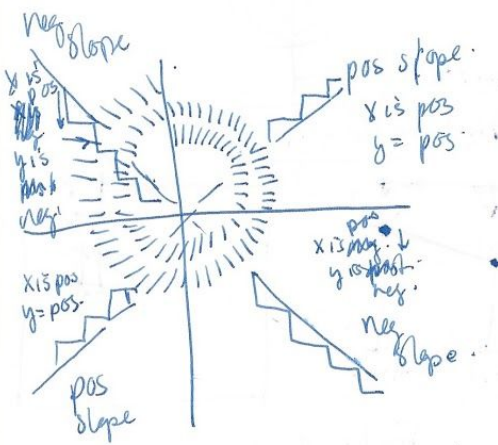
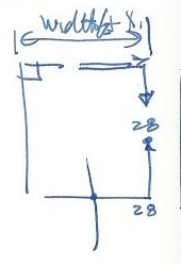
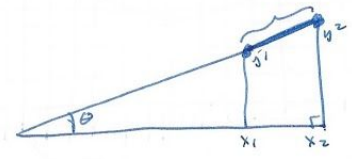
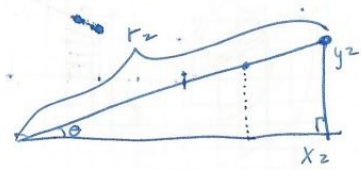
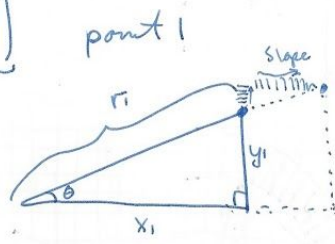
we need for point 1
 (r_1, x_1, y_1)
 we need for point 2
 (r_2, x_2, y_2)

make this line
 we need: slope?
 $(y_2 - y_1) / (x_2 - x_1)$

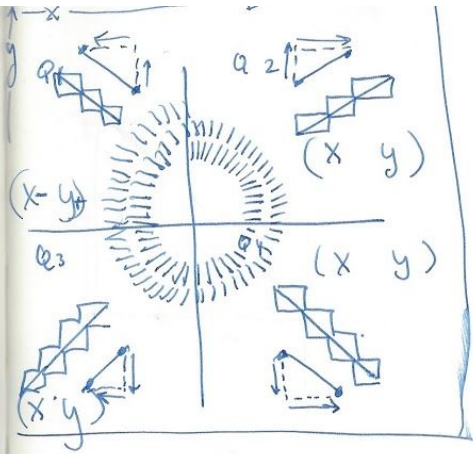
increment
 index θ $1 \rightarrow 360$
 $x_1 = 40 \cdot \cos(45)$
 $y_1 = 40 \cdot \sin(45)$
 $x_1 = r_1 \cdot \cos(\theta)$
 $y_1 = r_1 \cdot \sin(\theta)$

$x_2 = 50 \cdot \cos(45)$
 $y_2 = 50 \cdot \sin(45)$
 $x_2 = r_2 \cdot \cos(\theta)$
 $y_2 = r_2 \cdot \sin(\theta)$

$x = r \cdot \cos(\theta)$
 $y = r \cdot \sin(\theta)$

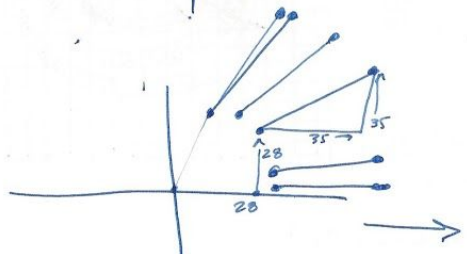
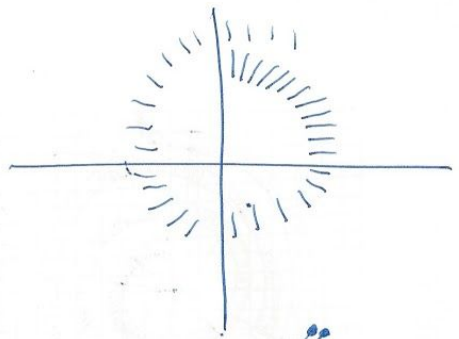


$\frac{\text{Rise}}{\text{Run}} = \text{slope}$
 $(350, 125)$
 $(375, 100)$
 $\text{slope} = -1$
 $\text{Rise} = y_2 - y_1$
 $\text{Run} = x_2 - x_1$



$$\text{Line} = (x_1, y_1, x_2, y_2)$$

$$\text{Line} = (28, 28, 35, 35)$$



in $\theta/2 + y_1$

$$x_1 = \text{radius} \cdot \cos(\theta);$$

↑ increase the radius as theta increases.

↑ go from $0-360^\circ$ or $0 \rightarrow 2\pi$

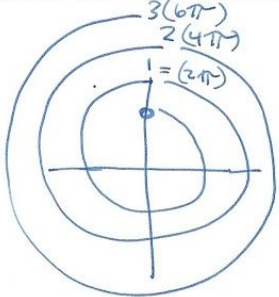
~~Line (x_1, y_1, x_2, y_2)~~

$$\text{Line} (R_1 \cdot \cos(\theta), R_1 \cdot \sin(\theta), R_2 \cdot \cos(\theta), R_2 \cdot \sin(\theta));$$

$x_1 = \text{radius} \cdot \cos(\theta) \rightarrow$ increase the radius as θ goes from $0 \rightarrow 360$ or $0 \rightarrow 2\pi$

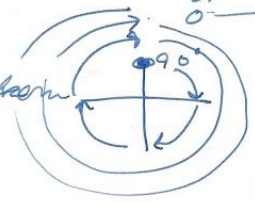
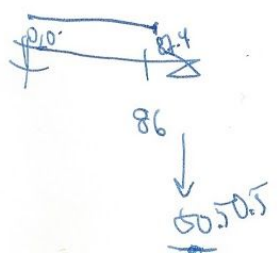
$y_1 = \text{radius} \cdot \sin(\theta) \rightarrow$ "same"

increase the radius ++ as theta goes from



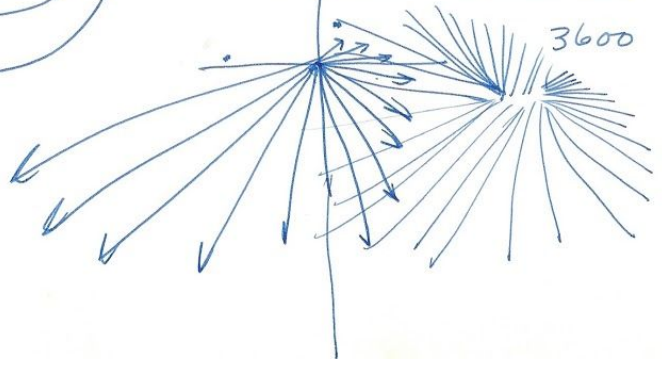
radius increases by 10 every change in theta. θ

3600 turns



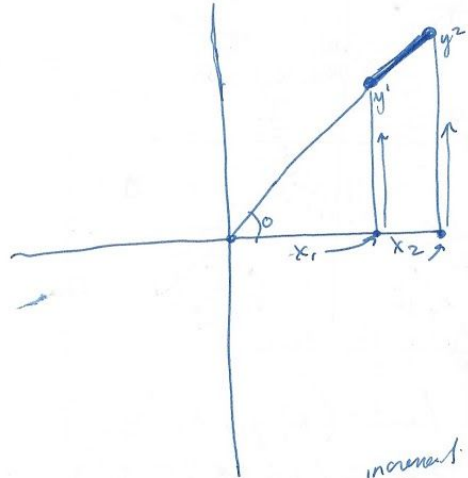
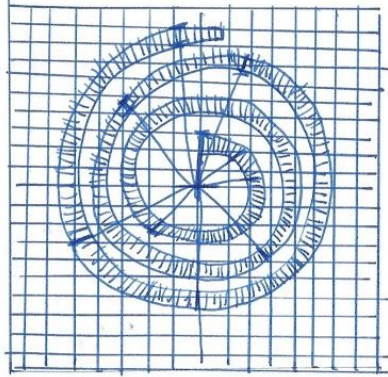
$2\pi = 1$ rotation
 $4\pi = 2$ rotations
 $6\pi = 3$ rotations

radius drops by 1 every turn



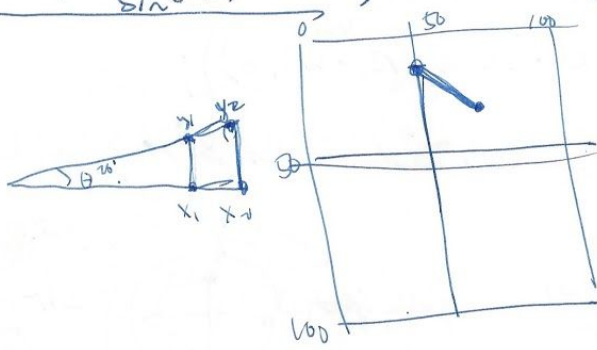
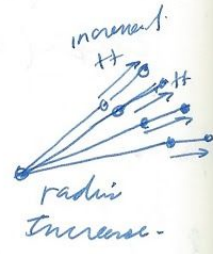
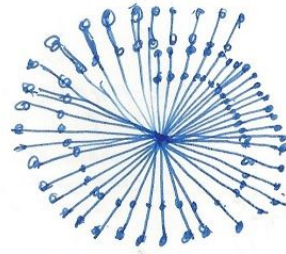
60 x 12

720



(50, 17, 70, 25)

$$\begin{aligned}
 x_1 &= r_1 \times \cos(\theta); \\
 y_1 &= r_1 \times \sin(\theta); \\
 x_2 &= r_2 \times \cos(\theta); \\
 y_2 &= r_2 \times \sin(\theta);
 \end{aligned}$$



```

noFill();
for (let i = 0; i < 20; i++) {
  stroke(200);
  ellipse(0, 0, 20*i, 20*i);
  stroke(200);
  square(0, 0, 20*i);
}

for (let i = 0; i < 360; i++){
  let a = 1;
  let r1 = 10;
  let r2 = 25;
  let x1 = r1+1/2 * cos(a);
  let x2 = r2+1/2 * cos(a);
  let y1 = r1+1/2 * sin(a);
  let y2 = r2+1/2 * sin(a);
  stroke(255,0,0);
  rotate(a + i/360);
  line(x1, y1, x2, y2);
}

// for (let i = 0; i < 100; i++) {
//   let n = 0;
//   let xrightSide = n + i;
//   let xleftSide = n - i;
//   let yupSide = n - i;
//   let ydownSide = n + i;
//   stroke(255, 0, 0);

```

