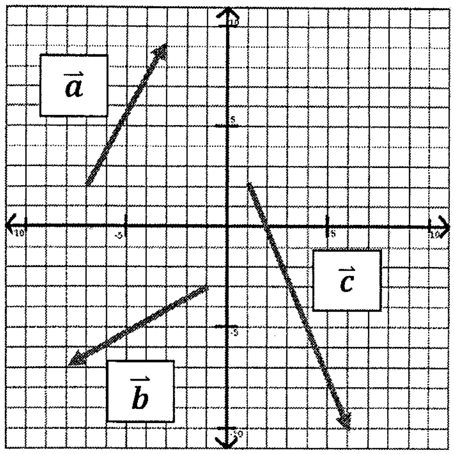
PreCalculus
Polars and Vectors - Review

Name Key
Period______

1. Write the component form of the following vectors:



A. $\vec{a} =$ $\langle 4, 7\rangle$ head $(-3,9)$ tail $(-7,2)$

B. $\vec{b} =$ $\langle -7, -4\rangle$ head $(-8,-7)$ tail $(-1,-3)$

C. $\vec{c} =$ $\langle 5, -12\rangle$ head $(6,-10)$ tail $(1,2)$

2. Use $\vec{u}, \vec{v}$, and $\vec{w}$ to determine the following information:

$\vec{u} = \langle 1, 4 \rangle$ $\quad$ $\vec{v} = \langle -3, 9 \rangle$ $\quad$ $\vec{w} = \langle 2, -8 \rangle$

A. $\vec{v} + \vec{w}$ $= \langle -3+2, 9+-8\rangle$
$= \langle -1, 1\rangle$

B. $3\vec{u} - 2\vec{v}$
$3\langle 1,4\rangle - 2\langle -3,9\rangle$
$\langle 3,12\rangle + \langle -6, 18\rangle$
$= \langle 9, -6\rangle$

C. $\vec{w} - \vec{u}$
$\langle 2,-8\rangle - \langle 1,4\rangle$
$= \langle 1,-12\rangle$

D. $|\vec{v}|$ $= \sqrt{9+81}$
$= \sqrt{90}$
$= 3\sqrt{10}$

E. $|\vec{u} + \vec{w}|$
$\vec{u}+\vec{w} = \langle 1,4\rangle + \langle 2,-8\rangle$
$= \langle 3,-4\rangle$
$\|\vec{u}+\vec{w}\| = \sqrt{9+16} = 5$

F. Direction of $\vec{v}$ Q2
$\hat{\theta} = \tan^{-1}(9/3) \approx 71.565$
$\theta = 180 - 71.565 \approx 108.435°$

3. Resolve the vector into its components.

A. magnitude 8 in the direction 135° (exact!)
$\langle 8\cos 135°, 8\sin 135°\rangle$
$\langle 8(-\frac{\sqrt{2}}{2}), 8(\frac{\sqrt{2}}{2})\rangle$
$\langle -4\sqrt{2}, 4\sqrt{2}\rangle$

B. magnitude 18 in the direction 243° (hundredths)
$\langle 18\cos 243°, 18\sin 243°\rangle$
$\langle -8.17, -16.04\rangle$

4. Convert the following rectangular equations to polar form showing all work.

A. $x^2 + y^2 = 9$
$r^2 = 9$
$r = 3$

B. $y = 4$
$r\sin\theta = 4$
$r = \frac{4}{\sin\theta} = 4\csc\theta$

C. $y = \frac{x^2}{5}$
$5r\sin\theta = r^2\cos^2\theta$
$5\sin\theta = r\cos^2\theta$
$\frac{5\sin\theta}{\cos^2\theta} = r$
$5\tan\theta\sec\theta = r$

C. $2x - 5y = 17$
$2r\cos\theta - 5r\sin\theta = 17$
$r(2\cos\theta - 5\sin\theta) = 17$
$r = \frac{17}{2\cos\theta - 5\sin\theta}$

5. Convert the following polar equations into rectangular equations.

A. $r = -8\sin\theta$
$r^2 = -8r\sin\theta$
$x^2 + y^2 = -8y$
$x^2+y^2+8y+16 = 16$
$x^2+(y+4)^2 = 16$

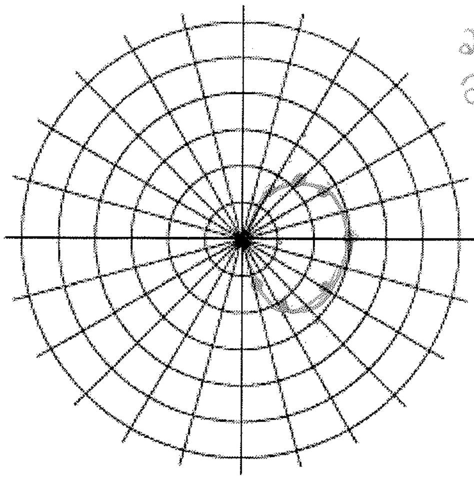
B. $r = 2\cos\theta + 2\sin\theta$
$r^2 = 2r\cos\theta + 2r\sin\theta$
$x^2+y^2 = 2x+2y$
$x^2-2x+1+y^2-2y+1 = 2$
$(x-1)^2+(y-1)^2 = 2$

C. $\tan\theta = 2$
$\frac{y}{x} = 2$
$y = 2x$

6. Name and Graph each polar curve.

A. $r = 3\cos\theta$
Name: circle

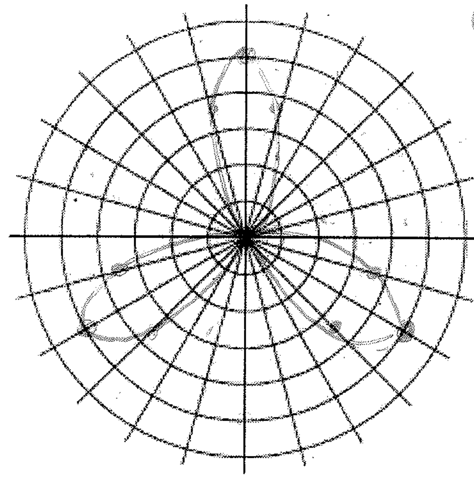
r	θ
2.60	30°
2.1	45°
1.5	60°



B. $r = -5\sin 3\theta$
Name: rose curve

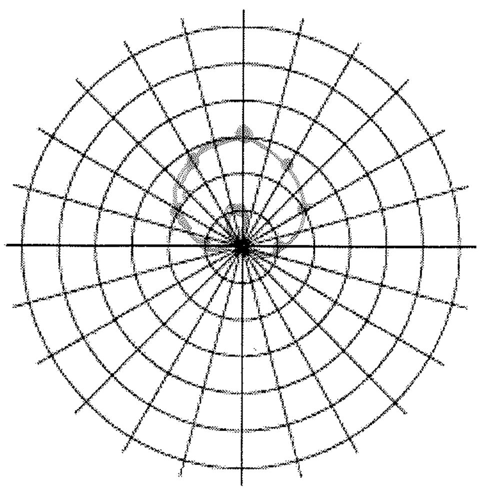
rose 3 petals
90/3 30°
neg
6 | 360
60°

r	θ
-3.5	15



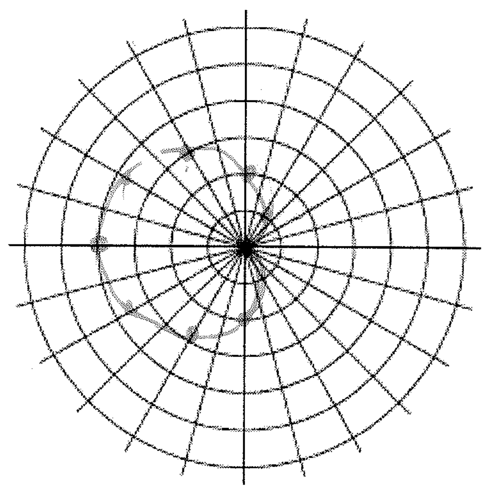
C. $r = 1 + 2\sin\theta$
Name: innerloop

1<2



D. $r = 2 - 2\cos\theta$
Name: cardiod

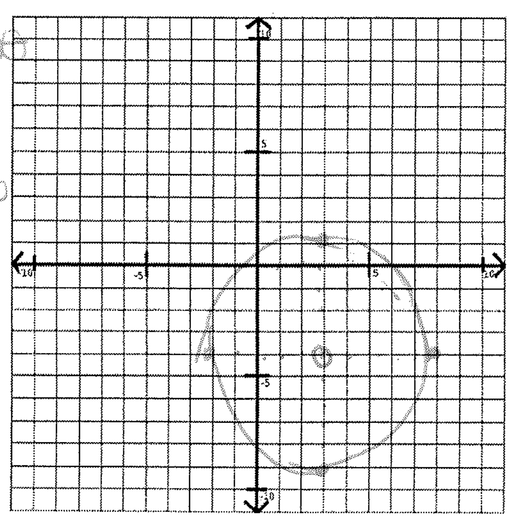
r	θ
	0
.27	30
.59	45
1	60
3	120
3.7	150



7. **Graph the equation in rectangular form on the coordinate plane.** *Hint: Convert to Rectangular form first!*

A. $r = 6\cos\theta - 8\sin\theta$

$r^2 = 6r\cos\theta - 8r\sin\theta$
$x^2 + y^2 - 6x + 8y = 0$
$x^2 - 6x + 9 + y^2 + 8y + 16 = 25$
$(x-3)^2 + (y+4)^2 = 25$
$C(3, -4)$
$r = 5$



B. $r = 4\cos\theta + 10\sin\theta$

$r^2 = 4r\cos\theta + 10r\sin\theta$
$x^2 - 4x + 4 + y^2 - 10y + 25$
$(x-2)^2 + (y-5)^2 = 29$
$= \sqrt{29}$
$(2, 5)$