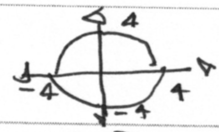
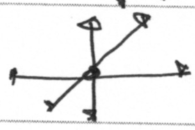
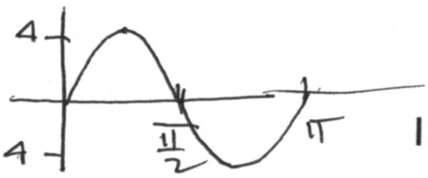
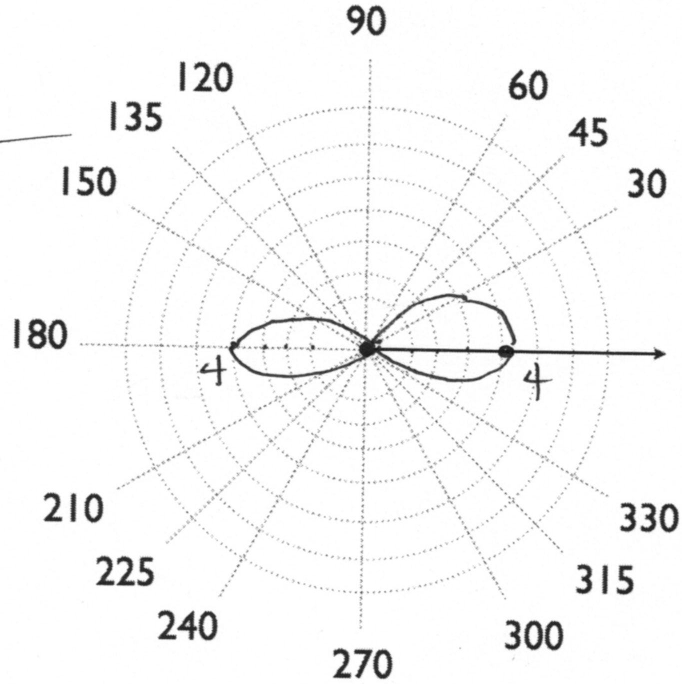
Answer Sheet

1	$x_1 = \frac{\pi}{3} + n\pi$ $x_2 = \frac{2\pi}{3} + n\pi$	13	$\sqrt{13}$
2	$x_1 = \frac{7\pi}{8} + \frac{2n\pi}{3}$ $x_2 = \frac{11\pi}{8} + \frac{2n\pi}{3}$	14	$\sqrt{17}$
3	$x = \frac{3\pi}{2} + 2n\pi$	15	18.8
4	solutions	16	115.2°
5	$\left(\frac{\sqrt{3}}{2}, \frac{3}{2}\right)$	17	$-149.6\bar{i} + 447.5\bar{j}$
6	$\left(2\sqrt{2}, \frac{7\pi}{6}\right)$	18	472 mph
7	$x^2+y^2=16$	19	N 18.5° W
8	$y = \sqrt{3}x$	20	$\bar{i} - 2\bar{j}$
9	$x^2+y^2=16$ 	21	$\sqrt{5}$
10	$y = \sqrt{3}x$ 	22	297°
11	Use Graph Paper	23	$\langle -1, 2 \rangle$
12	Use Graph Paper	24	Solutions

Graph Paper

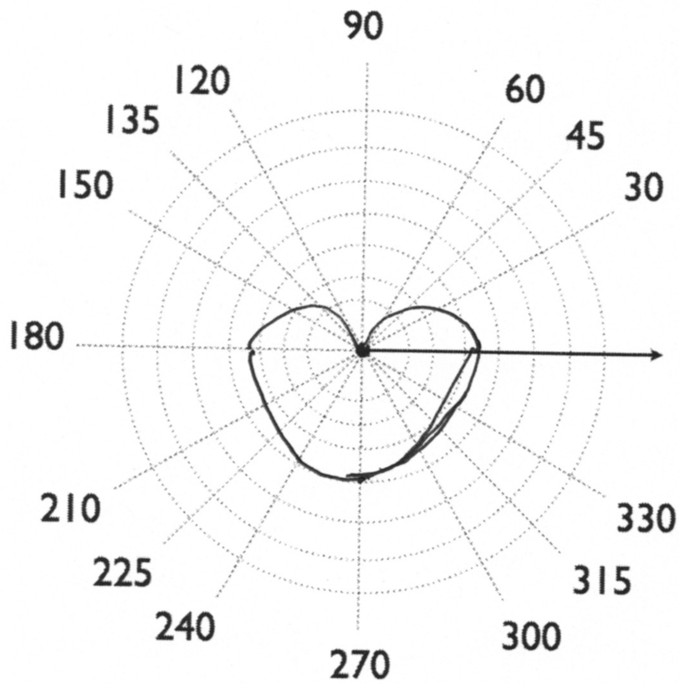
(11) $r^2 = 4\sin(2\theta)$





(12)

$r = 2 - 2\sin\theta$



East Los Angeles College
Department of Mathematics
Math 241
Test 4

Solve for x

1. $3csc^2(x) = 4$
2. $2sin(3x) + 1 = 0$
3. $tan\left(\frac{x}{2}\right) + 1 = 0$
4. what is your name?

Convert the polar coordinates to rectangular coordinates.

5. $\left(\sqrt{3}, \frac{-5\pi}{3}\right)$

Convert the rectangular coordinates to polar coordinates.

6. $(-\sqrt{6}, -\sqrt{2})$

Convert the polar equations to rectangular equations.

7. $r = 4$
8. $\theta = \frac{\pi}{3}$

Sketch the graph of the following polar curves.

9. $r = 4$
10. $\theta = \frac{\pi}{3}$
11. $r^2 = 4sin(2\theta)$
12. $r = 2 - 2sin(\theta)$

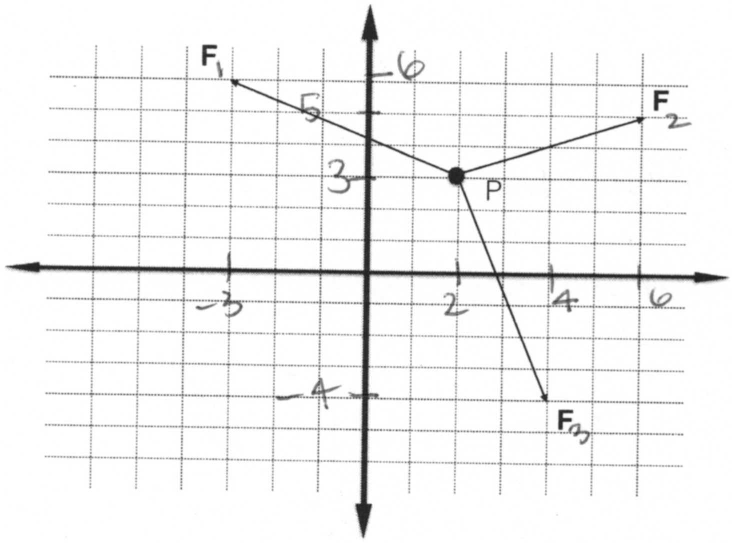
Let $\boldsymbol{v} = \boldsymbol{i} + \boldsymbol{j}$ and $\boldsymbol{w} = 2\boldsymbol{i} - 3\boldsymbol{j}$

13. Determine $|\boldsymbol{v} + \boldsymbol{w}|$
14. Determine $|\boldsymbol{v} - \boldsymbol{w}|$
15. Determine $|\boldsymbol{2v} - 5\boldsymbol{w}|$
16. The direction of $\boldsymbol{2v} - 5\boldsymbol{w}$

Velocity of a Jet- A pilot heads $N20^{\circ}W$ at a speed of 450 mph relative to the air. The wind is blowing $N10^{\circ}E$ at a speed of 25 mph.

17. Determine The true velocity vector of the jet with the wind in component form.
18. Determine the true speed of the Jet with the wind.
19. Determine the true heading-bearing of the Jet with the wind.

The following is a system of forces acting on a point P.



20. Determine the resultant force vector in component form.

21. Determine the magnitude of the resultant force vector.

22. Determine the direction of the resultant force vector.

23. Determine a force vector that could be added to the system so that the system is in equilibrium (static).

24. What is your name.

Math 241 Test 4

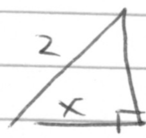
(1) $3\csc^2 x = 4$

$\csc^2 x = \frac{4}{3}$

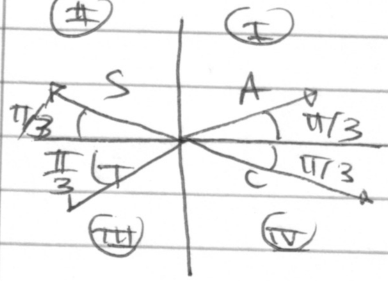
$\sin^2 x = \frac{3}{4}$

$\sin x = \pm\frac{\sqrt{3}}{2}$

Ref $\sin x = \frac{\sqrt{3}}{2}$



$x = \frac{\pi}{\cancel{6}3}$



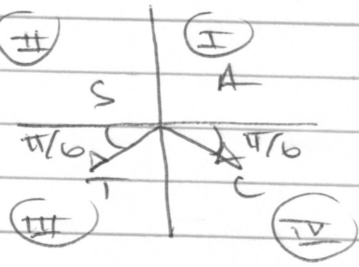
$$\boxed{\begin{aligned} x_1 &= \frac{\pi}{3} + n\pi \\ x_2 &= \frac{2\pi}{3} + n\pi \end{aligned}}$$

(2) $2\sin(3x) + 1 = 0$

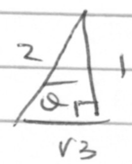
$\sin(3x) = -\frac{1}{2}$

let $\theta = 3x$

$\sin\theta = -\frac{1}{2}$



$\sin\bar{\theta} = \frac{1}{2}$



$\bar{\theta} = \frac{\pi}{6}$

$\theta_1 = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$

$\theta_2 = 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$

$\theta_1 = \frac{7\pi}{6} + 2n\pi$

$\theta_2 = \frac{11\pi}{6} + 2n\pi$

$3x_1 = \frac{7\pi}{6} + 2n\pi$

$$\boxed{x_1 = \frac{7\pi}{18} + \frac{2n\pi}{3}}$$

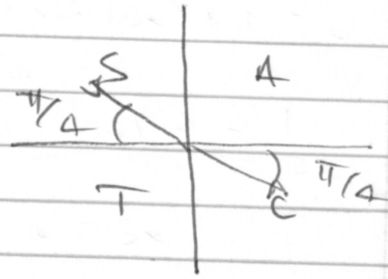
~~$x_2 = \frac{11\pi}{6} + 3n$~~

$3x_2 = \frac{11\pi}{6} + 2n\pi$

$$\boxed{x_2 = \frac{11\pi}{18} + \frac{2n\pi}{3}}$$

(3) $\tan\left(\frac{x}{2}\right)+1=0$

$\tan\left(\frac{x}{2}\right)=-1$



let $\theta=\frac{x}{2}$

$\tan(\theta)=-1$

$\theta_1=\frac{3\pi}{4}$; $\theta_2=\frac{7\pi}{4}$

$\theta=\frac{3\pi}{4}+n\pi$; $\frac{x}{2}=\frac{3\pi}{4}+n\pi$

$\boxed{x=\frac{3\pi}{2}+2n\pi}$

(4) Solutions

(5) $(\sqrt{3}, -\frac{5\pi}{3})$; $x=r\cos\theta$

$x=\sqrt{3}\cos\left(-\frac{5\pi}{2}\right)$

$x=\frac{\sqrt{3}}{2}$

$y=r\sin(\theta)$

$y=\sqrt{3}\sin\left(-\frac{5\pi}{2}\right)$

$y=\frac{3}{2}$

$\boxed{\left(\frac{\sqrt{3}}{2}, \frac{3}{2}\right)}$

(6) $r = \sqrt{(-\sqrt{6})^2 + (-\sqrt{2})^2} = \sqrt{6 + 2}$

$= \sqrt{8} = 2\sqrt{2}$

$\tan\theta = -\frac{\sqrt{2}}{-\sqrt{6}}$; $\theta = \tan^{-1}\left(\frac{\sqrt{2}}{\sqrt{6}}\right)$

$\theta \approx 30^\circ = \frac{\pi}{6}$

But, $(-\sqrt{6}, -\sqrt{2})$ in Q III

so, $\theta = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$

$\boxed{\left(2\sqrt{2}, \frac{7\pi}{6}\right)}$

(7) $r = 4$; $r^2 = 16$; $\boxed{x^2 + y^2 = 16}$

$x^2 + y^2$

(8) $\theta = \frac{\pi}{3}$; $\tan\theta = \frac{y}{x}$; $\tan\frac{\pi}{3} = \frac{y}{x}$

$y = \tan\left(\frac{\pi}{3}\right) x$; $\boxed{y = \sqrt{3}\, x}$

(9) $r = 4$; $r^2 = 16$; $\boxed{x^2 + y^2 = 16}$

$\Downarrow$

$x^2 + y^2$

circle

$C(0,0)$; $r = 4$

(10) $\theta = \frac{\pi}{3}$; $\tan\theta = \tan\frac{\pi}{3}$;

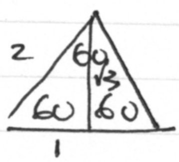
$\Downarrow$

$\frac{y}{x}$

$\tan\frac{\pi}{3} = \frac{y}{x}$; $y = \tan\frac{\pi}{3}\, x$

$\Downarrow$

60°



$\tan 60^\circ = \frac{\sqrt{3}}{1} = \sqrt{3}$

$y = \sqrt{3}x$ $\boxed{y = \sqrt{3}\, x}$

(13) $\bar{v} + \bar{w} = \bar{i} + \bar{j} + 2\bar{i} - 3\bar{j}$

$= 3\bar{i} - 2\bar{j}$

$|\bar{v} + \bar{w}| = \sqrt{3^2 + (-2)^2} = \sqrt{9+4} = \sqrt{13}$

(14) $\bar{v} - \bar{w} = \bar{i} + \bar{j} - 2\bar{i} + 3\bar{j}$

$= -\bar{i} + 4\bar{j}$

$|\bar{v} - \bar{w}| = \sqrt{(-1)^2 + 4^2} = \sqrt{1+16} = \sqrt{17}$

(15) $2\bar{v} - 5\bar{w} = 2(\bar{i} + \bar{j}) - 5(2\bar{i} - 3\bar{j})$

$= 2\bar{i} + 2\bar{j} - 10\bar{i} + 15\bar{j}$

$= -8\bar{i} + 17\bar{j}$

$|2\bar{v} - 5\bar{w}| = \sqrt{(-8)^2 + 17^2}$

$= \sqrt{64 + 289}$

$= \sqrt{353} \approx 18.8$

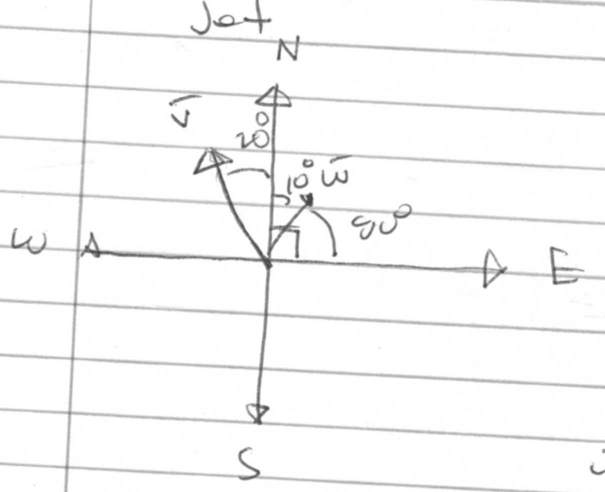
(16) $\tan\theta = \dfrac{17}{-8}$ $\quad$ ~~tan~~ $\quad \theta = \tan^{-1}\left(\dfrac{17}{-8}\right)$

$\theta \approx -64.8^\circ$

$2\bar{v} - 5\bar{w} = \langle -8, 17 \rangle$

Q II

$\theta = 180 - 64.8^\circ = \boxed{115.2^\circ}$



$\bar{v} = |\bar{v}| \cos\theta\, \bar{i} + |\bar{v}| \sin\theta\, \bar{j}$

$= 450 \cos 110^\circ\, \bar{i} + 450 \sin 110^\circ\, \bar{j}$

$\bar{v} = -153.9\, \bar{i} + 422.9\, \bar{j}$

$\bar{w} = |\bar{w}| \cos\theta\, \bar{i} + |\bar{w}| \sin\theta\, \bar{j}$

$\bar{w} = 25 \cos 80\, \bar{i} + 25 \sin 80\, \bar{j}$

$\bar{w} = 4.3\, \bar{i} + 24.6\, \bar{j}$

$$\begin{aligned} \bar{v} + \bar{w} &= -153.9\bar{i} + 422.9\bar{j} \\ &\ \ \ \ 4.3\bar{i} + 24.6\bar{j} \end{aligned}$$

(17) $\boxed{\bar{v} + \bar{w} = -149.6\bar{i} + 447.5\bar{j}}$

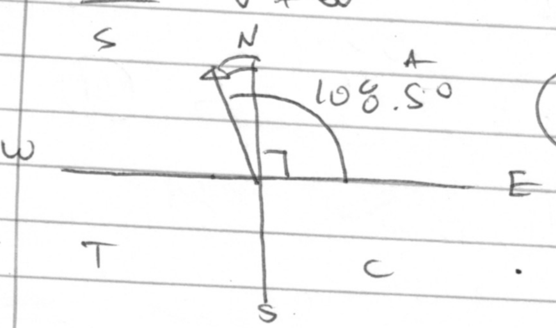
$|\bar{v} + \bar{w}| = \sqrt{(-149.6)^2 + 447.5^2}$

(18) $|\bar{v} + \bar{w}| = 471.8$ mph

$\tan\theta = \dfrac{447.5}{-149.6}$; $\theta = \tan^{-1}\left(\dfrac{447.5}{-149.6}\right)$

$\theta \approx -71.5^\circ$

note



$\theta = 180 - 71.5^\circ = 108.5^\circ$

(19) $108.5^\circ - 90 = 18.5^\circ$

$\boxed{N\ 18.5^\circ\ W}$

(20) $\overline{F_1} = \langle -3-2, 6-3 \rangle = \langle -5, 3 \rangle$

TP $(-3, 6)$

IP $(2, 3)$

$\overline{F_1} = -5\bar{i} + 3\bar{j}$

$\overline{F_2} = \langle 6-2, 5-3 \rangle = \langle 4, 2 \rangle$

TP $(6, 5)$

IP $(2, 3)$

$\overline{F_2} = 4\bar{i} + 2\bar{j}$

$\overline{F_3} = \langle 4-2, -4-3 \rangle = \langle 2, -7 \rangle$

TP $(4, -4)$

IP $(2, 3)$

$\overline{F_3} = 2\bar{i} - 7\bar{j}$

$$\overline{F_1} + \overline{F_2} + \overline{F_3} = -5\bar{i} + 3\bar{j}$$
$$+ 4\bar{i} + 2\bar{j}$$
$$+ 2\bar{i} - 7\bar{j}$$

$\boxed{\text{Resultant} = \bar{i} - 2\bar{j}}$

(21) $|\text{Resultant}| = \sqrt{1^2 + (-2)^2}$

$= \sqrt{1+4} = \sqrt{5}$

(22) $\tan\theta = -\frac{2}{1}$; $\theta = \tan^{-1}(-2)$

$\theta \approx -63^\circ$; $\theta = 360 - 63^\circ$

$\theta = 297^\circ$

(23) Equal and opposite force

$\boxed{\langle -1, 2 \rangle}$