Accel. PreCalculus
Vector & Parametric Eqns Review

Name Key
Date

For # 1-4, use the given information to write each vector in component form.

1. $\overrightarrow{RS}$ where $R=(-3,9)$ and $S=(8,-1)$

$\langle 8-(-3),\ -1-9 \rangle$

$\langle 11, -10 \rangle$

2. $\overrightarrow{PQ}$ where $P=(-10,5)$ and $Q=(-9,-10)$

$\langle -9-(-10),\ -10-5 \rangle$

$\langle 1, -15 \rangle$

3. The magnitude of vector v is 35 and the direction angle is $60°$.

$\langle 35\cos 60,\ 35\sin 60 \rangle = \langle 17.5,\ 30.31 \rangle$

4. $|\vec{k}|=52, 174°$

$\langle 52\cos 174,\ 52\sin 174 \rangle = \langle -51.72,\ 5.44 \rangle$

For # 5-6, find the magnitude and direction angle of each vector.

5. $8i+15j$

$|v| = \sqrt{8^2+15^2} = 17$

$\tan\theta = \frac{15}{8}$ $\theta = 61.92°$

6. $\vec{r}=\langle -8,-41 \rangle$

$|r| = \sqrt{(-8)^2+(-41)^2} = 41.77$

$\tan\theta = \left(\frac{-41}{-8}\right)$ $\theta = 78.959 + 180 = 258.96°$

7. Find the component form, magnitude and direction angle for the given vector:

$\overrightarrow{CD}$ where $C=(6,-3)$ and $D=(-6,-9)$

$\langle -6-6,\ -9-(-3) \rangle = \langle -12, -6 \rangle$

$|v| = \sqrt{(-12)^2+(-6)^2} = 13.41$

$\tan\theta = \frac{-6}{-12}$

$\theta = 26.565 + 180 = 206.565$

For # 8-10, find the component form of the resultant vector.

8. $\vec{u}=\langle 20,-21 \rangle$; Find: $-3\vec{u}$

$-3\langle 20, -21 \rangle$

$= \langle -60, 63 \rangle$

9. $\vec{u}=\langle 3,3 \rangle$, $\vec{v}=\langle 11,8 \rangle$; Find: $\vec{u}+\vec{v}$

$\langle 14, 11 \rangle$

10. $\vec{u}=\langle 12,2 \rangle$, $\vec{v}=\langle 2,4 \rangle$; Find: $4\vec{u}-6\vec{v}$

$\langle 36, -16 \rangle$

11. Given $A=(4,0)$ and $B=(-6,10)$, find a unit vector in the direction of $\overrightarrow{AB}$.

$\langle -6-4,\ 10-0 \rangle$

$\langle -10, 10 \rangle$

unit vector $= \frac{v}{|v|} = \frac{\langle -10, 10 \rangle}{\sqrt{(-10)^2+10^2}} = \frac{1}{10\sqrt{2}}\langle -10, 10 \rangle = \left\langle \frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$

$= \left\langle \frac{-\sqrt{2}}{2}, \frac{\sqrt{2}}{2} \right\rangle$

For # 12-13, find the dot product of the given vectors.

12. $\vec{u}=\langle 3,9 \rangle$, $\vec{v}=\langle 6,5 \rangle$

$u \cdot v = (3)(6) + (9)(5)$

$= 63$

13. $\vec{u}=-i+5j$ and $\vec{v}=-6i-2j$

$\langle -1, 5 \rangle$ $\langle -6, -2 \rangle$

$u \cdot v = (-1)(-6) + (5)(-2)$

$= -4$

For # 14-15, state whether the two vectors are parallel, orthogonal, or neither.

14. $\vec{u}=\langle 4,-9\rangle$, $\vec{v}=\langle -9,4\rangle$ Neither

$u\cdot v = (4)(-9)+(-9)(4)=-72$

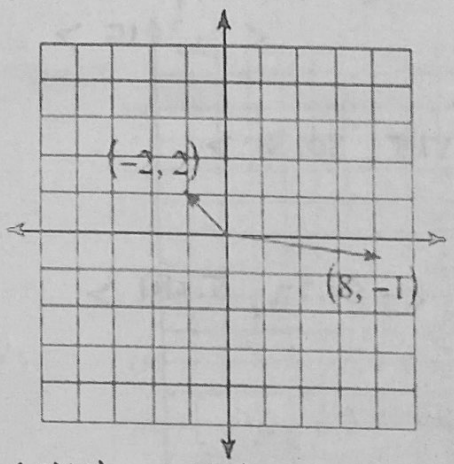
15. $\vec{u}=-5i-2j$ and $\vec{v}=-10i+25j$

$u\cdot v = (-5)(-10)+(-2)(25)=0$

orthogonal

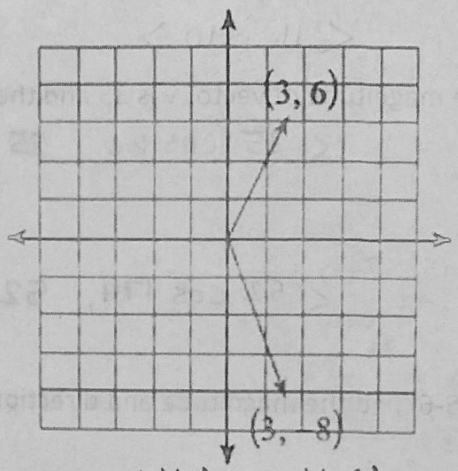
For # 16-17, find the measure of the angle between the two vectors.

16.



$$\cos\theta=\frac{(-2)(8)+(2)(-1)}{\sqrt{2^2+2^2}\sqrt{8^2+1^2}}=\frac{-18}{\sqrt{8}\sqrt{65}} \qquad \theta=142.13^\circ$$

17.

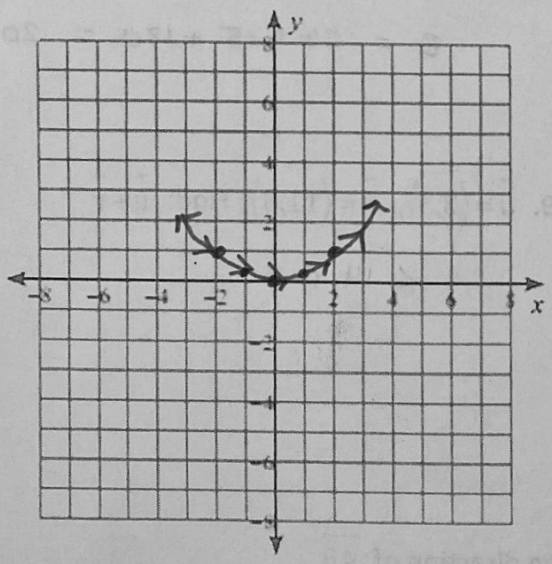


$$\cos\theta=\frac{(3)(3)+(6)(-8)}{\sqrt{3^2+6^2}\sqrt{3^2+8^2}}=\frac{-39}{\sqrt{45}\sqrt{73}}$$

$\theta = 132.88^\circ$

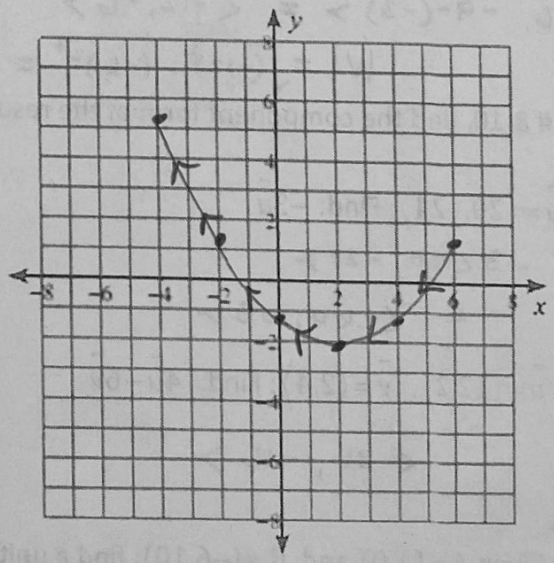
For # 18-20, sketch the curve for each pair of parametric equations.

18. $x=t$, $y=\frac{t^2}{4}$



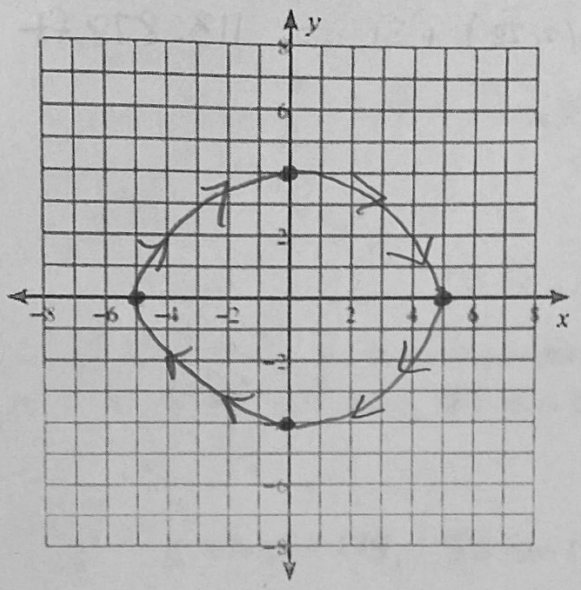
t	x	y
-2	-2	1
-1	-1	1/4
0	0	0
1	1	1/4
2	2	1

19. $x=-2t+2$, $y=\frac{4t^2}{5}-2$, $-2\le t\le 3$



t	x	y
-2	6	6/5
-1	4	-4/5
0	2	-2
1	0	-4/5
2	-2	6/5
3	-4	26/5

20. $x = 5\sin t$, $y = 4\cos t$



t	x	y
0	0	4
$\pi/4$		
$\pi/2$	5	0
$3\pi/4$		
π	0	-4
$5\pi/4$		
$3\pi/2$	-5	0
$7\pi/4$		
2π	0	4

For # 21-22, write each pair of parametric equations in rectangular form.

21. $x = -\frac{t^2}{3}$, $y = t$

$x = \frac{-y^2}{3}$

22. $x = -2t - 3$, $y = 2t^2 + 2t - \frac{5}{2}$

$y = \frac{x^2}{6} + \frac{2x}{3} - \frac{1}{3}$

23. A cannon ball is fired across a flat field at an angle of $45°$ with an initial speed of 103 ft/s and an initial height of 31ft.

a) Write a set of parametric equations for the motion of the cannon ball.

$x = (103\cos 45)t$

$x = \frac{103\sqrt{2}}{2}t = 72.83t$

$y = -16t^2 + 72.83t + 31$

b) Determine how long the cannon ball was in the air.

$-16t^2 + 72.83t + 31 = 0$

Use Quadratic Formula

$t = 4.92\text{sec}$

c) Determine how far the cannon ball traveled in the air.

$x = 72.83(4.92) = 358.33\text{ ft}$

d) Determine when the cannon ball reached its maximum height.

$\text{vertex} = \frac{-b}{2a} = \frac{-72.83}{2(-16)} = 2.28\text{ sec}$

e) Determine the maximum height reached by the cannon ball.

$y = -16(2.28)^2 + 72.83(2.28) + 31 = 113.878$ ft

f) Sketch a graph of the parametric equations.