# Warm - Up

Given **v** = <-3, -2, 5>, determine which vectors are parallel to **v**.

<6, 4, -10> $\frac{-3}{6}$ $\frac{-2}{4}$ $\frac{5}{-10}$ $c = -1/2$

<-3/2, -1, -5/2> $\frac{-3}{-3/2}$ $\frac{-2}{-1}$ $\frac{5}{-5/2}$ ✗

<2, 4/3, -10/3>

$\frac{-3}{2}$ $\frac{-2}{4/3}$ $\frac{5}{-10/3}$ $-2\frac{3}{4}$

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#WJ

#6 $3x - 9y = 19$

$3x - 9y = 11$

$x = 6$ $y = -1/9$

$3x - 9y - 11 = c$

A B C

$\frac{|3(6) - 9(-1/9) - 11|}{\sqrt{3^2 + -9^2}}$

$\frac{8}{\sqrt{90}}$

$3x - 9y = 19$

$-3x$ $-3x$

$-9y = -3x + 19$

$\frac{-9y}{-9} = \frac{-3x + 19}{-9}$

$y = 3x - 19$

$y =$ , 2nd, Table

$\langle 15, 1 \rangle \quad \langle -20, 1 \rangle$

$\cos\theta = \frac{u \cdot v}{|u||v|}$

$\cos\theta = \frac{\langle 15, 1 \rangle \cdot \langle -20, 1 \rangle}{|\langle 15, 1 \rangle| \, |\langle -20, 1 \rangle|}$

$= \frac{15 \cdot -20 + 1 \cdot 1}{\sqrt{15^2+1^2} \cdot \sqrt{-20^2+1^2}}$

$= \frac{-299}{301.84}$

$173^\circ$

**SWBAT** write vector and parametric equations of lines and graph parametric equations

Agenda:

- Warm - Up
- Refresh equation of a line
- Parametric equations
- Exit card

**Raindrops are falling and blown by the wind.**

**This gives us a horizontal and a vertical component.**

**However, now we want to talk about time**

The graph of the ordered pair (x, y) where

$$x = f(t),\ y = g(t)$$

are functions defined on an interval I of t values is a **parametric curve**. The equations are **parametric equations** of the curve, the variable t is a **parameter**.

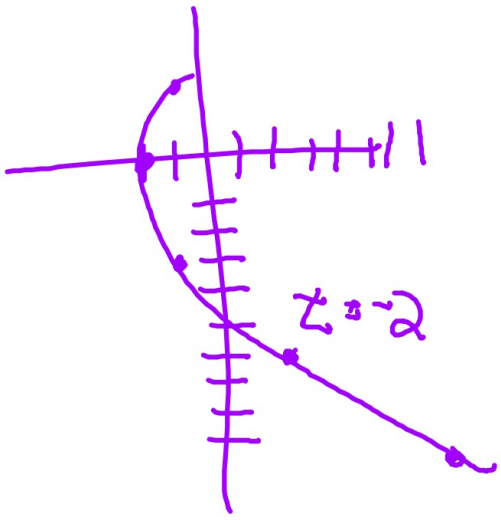
## Graphing Parametric Equations

Graph the parametric equations

$$x = t^2 - 2$$
$$y = 3t$$

on the interval $-3 \le t \le 1$

| x | y | t |
|---|---|---|
| 7 | -9 | -3 |
| 2 | -6 | -2 |
| -1 | -3 | -1 |
| -2 | 0 | 0 |
| -1 | 3 | 1 |




A line through $P_1(x_1,y_1)$ and parallel to the vector $\mathbf{a} = \langle a_1,a_2 \rangle$ has vector equation:

and parametrice quations

$$x = x_1 + ta_1$$
$$y = y_1 + ta_2$$

Example:

P(-2,1), **a** = <3, -4>

$x = -2 + 3t$

$y = 1 - 4t$

Example:

Write the parametric equationsof the line

y = (-1/2)x + 3

$\rightarrow a = \langle 2, -1 \rangle \quad P(6,0)$

$0 = -\frac{1}{2}x + 3$

$-3 \quad -3$

$-3 = -\frac{1}{2}x$

$6 = x$

$x = 6 + 2t$

$y = 0 - 1t$

$y = -t$

Now take

$$x = x_1 + ta_1$$
$$y = y_1 + ta_2$$

and solve for t

$$t = \frac{x - x_1}{a_1}$$

$$t = \frac{y - y_1}{a_2}$$

Therefore, the parametric equations of a line passing through two points $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$

$$x = x_1 + (x_2 - x_1)t$$
$$y = y_1 + (y_2 - y_1)t$$

Example:

Write the parametric equations of the line through the points A(-2, 0) and B(2, 2).

$x = -2 + 4t$

$y = 2t$

## Eliminating the Parameter

Eliminate the parameter and identify the graph of the parametric curve

$x = 1 - 2t$

$y = 2 - t$

$y = 2 - t$

$t + y = 2$

$t = 2 - y$

$x = 1 - 2(2 - y)$

$x = 1 - 4 + 2y$

$x = -3 + 2y$

$+3 \quad +3$

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

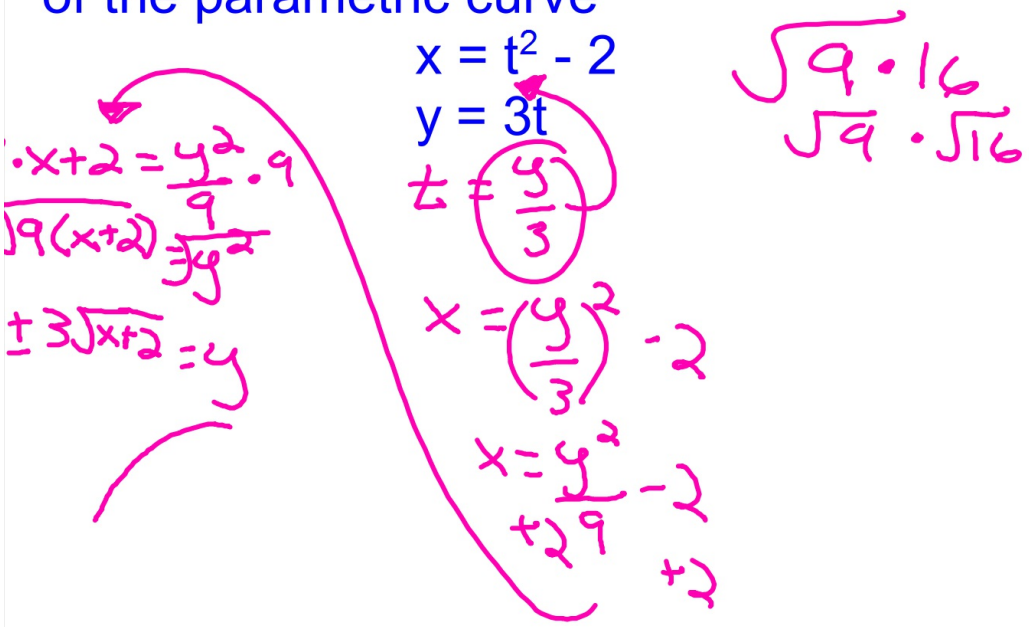
$\frac{1}{2}x + \frac{3}{2} = y$

## Eliminating the Parameter

Eliminate the parameter and identify the graph of the parametric curve

$x = t^2 - 2$

$y = 3t$




Eliminate the parameter and identify the graph of the parametric curve

$x = 2\cos(t)$

$y = 2\sin(t)$ $\quad 0 \le t \le 2\pi$

$x^2 = 4\cos^2 t$

$y^2 = 4\sin^2 t$

$x^2 + y^2 = 4\cos^2 t + 4\sin^2 t$

$x^2 + y^2 = 4(\cos^2 t + \sin^2 t)$

$x^2 + y^2 = 4$

Eliminate the parameter and identify the graph of the parametric curve

$$x = 3\cos(4t) + 5$$
$$y = 3\sin(4t) - 4$$
$$0 \le t \le 2\pi$$

$\frac{2\pi}{4} = \frac{\pi}{2}$

circle

$r = 3$

4 times around circle

Find the parametrization of the line throug the points A = (-2,3) and B = (3, 6)

Now, find a parametrization of this line segment.

## Quiz Outline for Friday

Parts
1) Entry Card from last class
2) Unit Vector
3) Vector Word Problem
4) Angle Between two Vectors
5) Vector Projection
6) Force

## Exit Card

**Eliminate the parameter.**

**$x = t - 4$**
**$y = t^2 + t - 6$**

$t = x + 4$

$y = (x+4)^2 + x + 4 - 6$

$y = x^2 + 8x + 16 + x + 4 - 6$

$x^2 + 9x + 14$