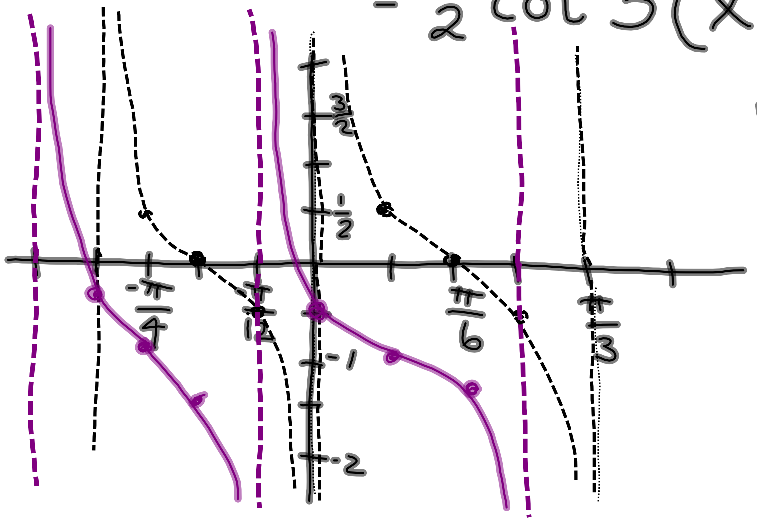
# Review:

Graph $y = \frac{1}{2}\cot\left(3x + \frac{\pi}{4}\right) - 1$

$= \frac{1}{2}\cot 3\left(x + \frac{\pi}{12}\right) - 1$




"amp": $\frac{1}{2}$

period: $\frac{\pi}{3}$

left $\pi/12$

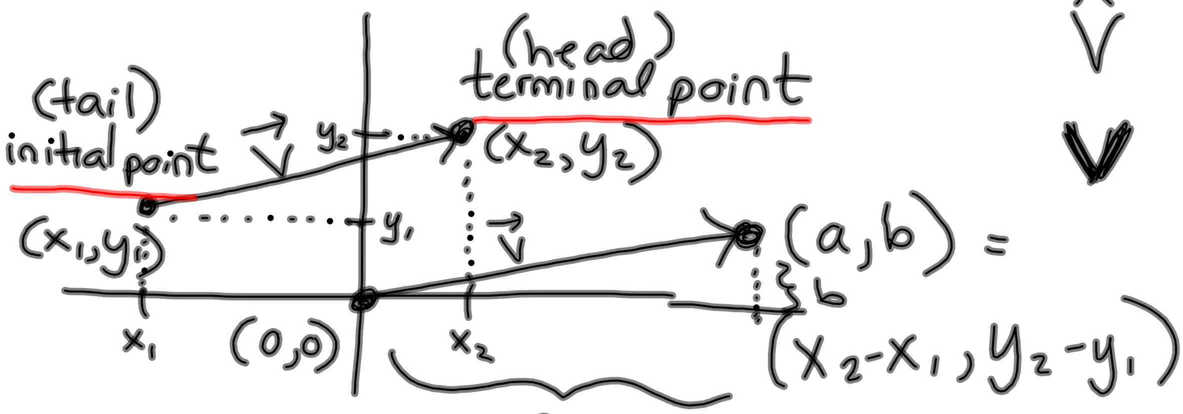
down 1

# Vectors! (7.5 & 7.6)

$\vec{v}$

$\hat{v}$

**v**




$\vec{v} = \langle a, b \rangle$ = "component form" of the vector whose initial point is $(0,0)$ and terminal point is $(a,b)$.

magnitude of $\vec{v} = |\vec{v}| = \sqrt{a^2+b^2}$

$\overrightarrow{CD}$ , $C(2,5)$ , $D(3,-1)$

initial pt terminal pt

find a vector $\vec{v}$ equivalent to $\overrightarrow{CD}$ whose initial point is $(0,0)$.

$\vec{v}$ = terminal pt. − initial pt

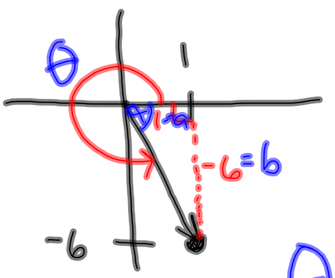
$= \langle 3-2, -1-5 \rangle = \boxed{\langle 1, -6 \rangle}$

Determine the magnitude and direction angle of $\vec{v} = \langle 1, -6 \rangle$.

magnitude: $|\vec{v}| = \sqrt{a^2+b^2}$

$|\vec{v}| = \sqrt{1^2+(-6)^2} = \boxed{\sqrt{37}}$

direction angle: measured counter-clockwise from positive x-axis




$\tan\alpha = \frac{-6}{1}$

$\alpha = |\tan^{-1}(-6)|$

$\theta = 360° - \alpha$

reference angle: $\left|\tan^{-1}\frac{b}{a}\right|$

# Vector operations

k is a real number, not a vector

$\vec{v} = \langle a,b \rangle$ ; $\vec{w} = \langle c,d \rangle$ ; $k \in \mathbb{R}$

1. $|\vec{v}| = \sqrt{a^2+b^2}$
2. "scalar multiplication" $k\vec{v} = k\langle a,b \rangle = \langle ka,kb \rangle$
3. $\vec{v}+\vec{w} = \langle a+c, b+d \rangle$
4. $-\vec{v} = \langle -a,-b \rangle$ (same vector, pointing in opposite direction)
5. $\vec{v}-\vec{w} = \langle a-c, b-d \rangle$
6. $\vec{0} = \langle 0,0 \rangle$ "zero vector"

$\vec{v} = \langle 12,-5 \rangle$ ; $\vec{w} = \langle 2,7 \rangle$

a. $|\vec{v}| = \sqrt{12^2+(-5)^2} = \boxed{13}$

b. $\vec{v}+\vec{w} = \langle 12+2, -5+7 \rangle = \boxed{\langle 14,2 \rangle}$

c. $-5\vec{v} = \langle -5(12), -5(-5) \rangle = \boxed{\langle -60,25 \rangle}$

d. $3\vec{v}-4\vec{w} = \langle 3(12)-4(2), 3(-5)-4(7) \rangle$
$= \boxed{\langle 28,-43 \rangle}$

$3\vec{v} = \langle 3(12), 3(-5) \rangle = \langle 36,-15 \rangle$
$4\vec{w} = \langle 4(2), 4(7) \rangle = \langle 8,28 \rangle$
$3\vec{v}-4\vec{w} = \langle 36-8, -15-28 \rangle = \langle 28,-43 \rangle$

# Vector Multiplication

$\vec{V} \cdot \vec{W}$ vs. $\vec{V} \times \vec{W}$

"dot product" "cross product"

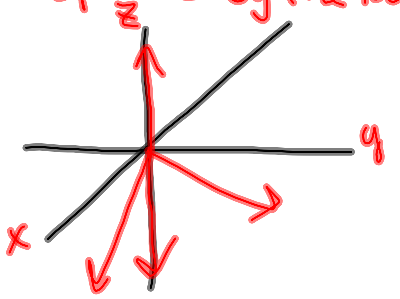
result is a scalar

$\vec{V} = \langle a,b \rangle ; \vec{w} = \langle c,d \rangle$

$\vec{V} \cdot \vec{w} = ac + bd$

result is a vector

perpendicular to the plane spanned by the two vectors




$\vec{V}_1 = \langle 1,2 \rangle ; \vec{V}_2 = \langle -3,4 \rangle ; \vec{V}_3 = \langle 5,-6 \rangle$

$\vec{V}_1 \cdot \vec{V}_2 = 1(-3) + 2(4) = -3+8 = \boxed{5}$

$\vec{V}_1 \cdot \langle \vec{V}_2 + \vec{V}_3 \rangle = \langle 1,2 \rangle \cdot \langle -3+5, 4+(-6) \rangle$

$= \langle 1,2 \rangle \cdot \langle 2,-2 \rangle$

$= 1(2) + 2(-2)$

$= \boxed{-2}$

HW
Collect Wed: Ch5 & Ch6 Tests

7.5 #27, 29

7.6 #9-26 all
(due Friday)