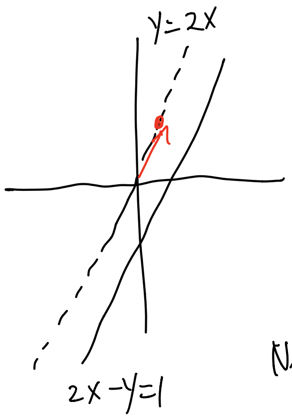
Math 9 F19 Quiz 3 **Name:** Solution

(1) (5 pts) Find the acute angle between the lines in $\mathbb{R}^2$:

$$2x - y = 1$$
$$3x + y = -1$$

The slope of the first line is 2. To find a parallel vector, we can find a parallel vector to a line through the origin: $y = 2x$.

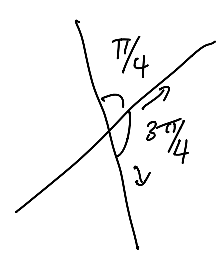


Since $(1,2)$ is on the line $y = 2x$, a parallel vector is $\langle 1,2\rangle$.

Similarly, you can find a parallel vector $\langle 1,-3\rangle$ to $3x+y=-1$.

Now, find the angle θ between them: $\cos\theta = \dfrac{\langle 1,-3\rangle \cdot \langle 1,2\rangle}{|\langle 1,-3\rangle|\,|\langle 1,2\rangle|} = \dfrac{-5}{\sqrt{10}\sqrt{5}} = -\dfrac{1}{\sqrt{2}}$

$\theta = \frac{3\pi}{4}$. But we want acute angle, which is $\boxed{\pi/4}$

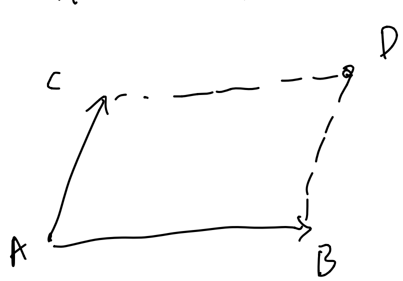


(2) (5 pts) Find the area of the parallelogram with vertices $A(-3,0)$, $B(-1,3)$, $C(5,2)$, and $D(3,-1)$.

$\vec{AB} = \langle 2, 3\rangle \to \langle 2,3,0\rangle$

$\vec{AC} = \langle 8, 2\rangle \to \langle 8,2,0\rangle$ in $\mathbb{R}^3$.

$\vec{AD} = \langle 6,-1\rangle \to \langle 6,-1,0\rangle$



Area $= |\vec{AB} \times \vec{AD}| = \left| \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 3 & 0 \\ 6 & -1 & 0 \end{vmatrix} \right| = 20$ the area $= 20$ unit^2.