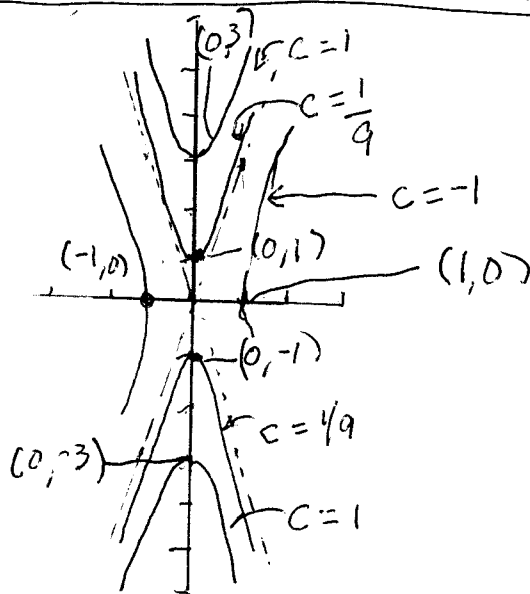


①

These contours are hyperbolas.



② $z = m(x) + ny + b$. $b = f(0,0) = 2$.

$m = \frac{4-2}{1-0} = 2$. $n = \frac{1-2}{1-0} = -1$

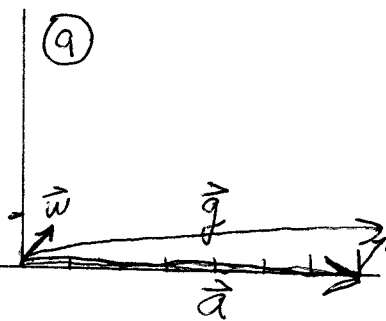
$\therefore f(x,y) = \boxed{z = 2x - y + 2}$

③ $\vec{v} = (1, -1, 2)$ is perpendicular to the plane.

④ $\lim_{x \rightarrow 0} f(x,0) = \frac{x^2}{x^2} = 1$, while $\lim_{y \rightarrow 0} f(0,y) = \frac{-y^2}{y^2} = -1 \neq 1$.

Therefore, $\lim_{(x,y) \rightarrow (0,0)} f(x,y)$ does not exist.

⑤ Let \vec{a} be the plane's air velocity, \vec{w} be the wind velocity, and \vec{g} be the plane's ground velocity.



⑥ $\vec{a} = (700, 0)$; $\vec{b} = \frac{1}{\sqrt{2}}(100, 100) \approx (70.7, 70.7)$

$\vec{g} \approx (770.7, 70.7)$

⑦ $s \approx \sqrt{(770.7)^2 + (70.7)^2} \approx 774 \text{ kph}$

⑧ The angle is approximately $\arctan\left(\frac{70.7}{770.7}\right) \approx 5.24 \text{ degrees}$
 $\approx 0.09 \text{ radians}$