Find the value of the function at the given point, and then sketch the gradient vector, and the contour curve passing through that point.

1) $f(x,y)=y+x$ at $(2,1)$

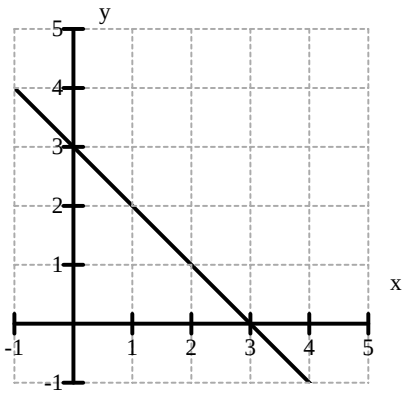
a) Evaluate the function first at (2,1): $f(2,1)=1+2=3$
This value becomes the level or contour curve.

b) Set the function equal to 3, and plot the level curve.
$f(x,y)=3 \Rightarrow x+y=3$

To plot this level curve, use x and y intercepts.

Set y=0 to get the x intercept.
$x=3$

Set x=0 to get the y intercept
$y=3$



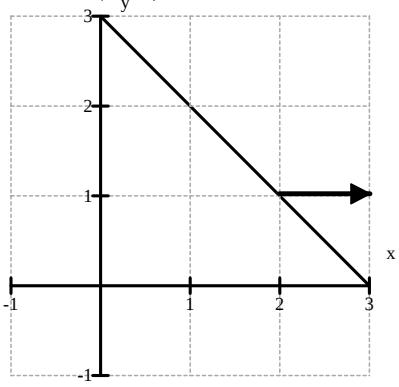
c) Form the gradient by taking the partials, and putting them in a vector.
$\nabla f(x,y)=\langle \frac{\partial}{\partial x}(y+x), \frac{\partial}{\partial y}(y+x) \rangle = \langle 1 , 1 \rangle$

d) Evaluate the gradient at the given point.

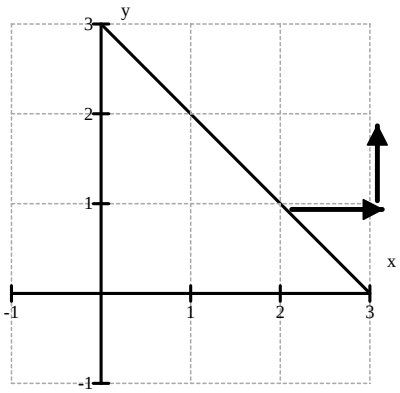
$\nabla f(2,1)= \langle 1 , 1 \rangle$

In this problem, the gradient is constant. This simply means that the x component of the gradient, which is the slope along the x axis, is always 1. Also, the y component of the gradient is also 1, so the slope in the y direction is also always 1.

1) Draw the x component from (2,1).



2) Draw the y component from from the end of the x component.



3) Draw the gradient