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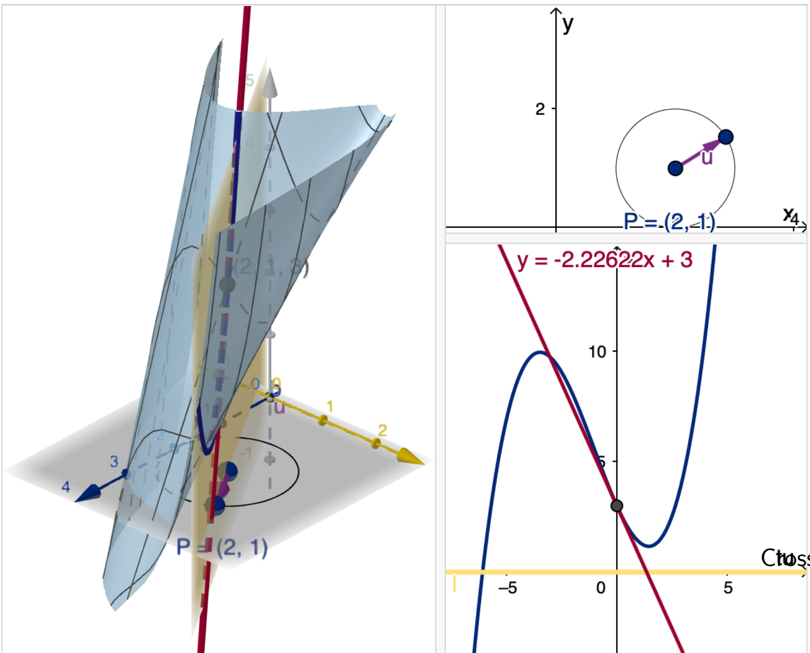


Cross section in $\vec{u}$ direction
($\vec{u}z$ plane)

In this applet, you can rotate the endpoint of vector $\vec{u}$ to produce different cross sections of the graph. Notice the red tangent line adjusts to lie in your chosen cross section.

Move the vector $\vec{u}$ around until the tangent line has a slope as close to 0 as possible. We'll call that vector $\vec{u}_0$. Click the button below to save its coordinates.

$\vec{u}_0 =$

Save u_0 (-0.4507789587116,0.8926356089597174)

D1

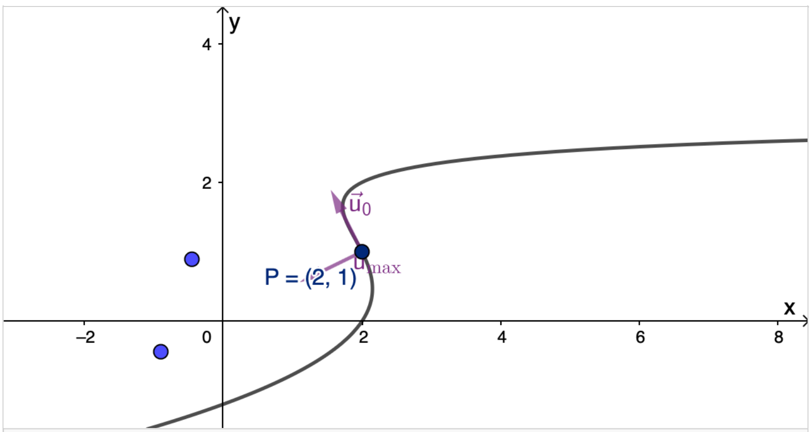
Other Cross Sections

Consult with your group: what number in the applet tells you the slope of the tangent line? Now move $\vec{u}$ around until the tangent line has the steepest slope possible. Call that vector $\vec{u}_{\text{max}}$ and click to save.

$\vec{u}_{\max} =$

5 points Now compute the equation of the level curve of f that passes through $(2, 1)$. Type it into the input box on this Geogebra window and press enter to see the graph. What geometric relationships do you notice between the level curve, $\vec{u}_{\text{max}}$ and $\vec{u}_0$? Consult with your group and give your answer in 3-4 sentences.

Save u_{max} (-0.8983945687227144,-0.43918925179189894)



Input…

I noticed that the level curve passes through both vector u_max and vector u_0 at (2, 1).

At the same time, vector u_max and vector u_0 are orthogonal.

D2

Other Cross Sections

3 points Now calculate the partial derivatives $f_x(2, 1)$ and $f_y(2, 1)$.

$f_x(2, 1) =$
$f_y(2, 1) =$

2 points The $\vec{u}$ and $\vec{u}$ that you found were approximations, rather than the exact value. With this in mind, compare your results with students around you and determine how the components of $\vec{u}_{\text{max}}$ are numerically related to the values $f_x(2,1)$ and $f_y(2,1)$. Your answer can be a sentence or an equation.

-2
-1

As we calculated the partial derivatives of fx(2,1) and fy(2, 1), I found that the ratio between fx(2,1) and fy(2.1) is approximately the ratio between the vector u_max's x-component and y-component.

When you are done, make sure your graphs show the information you want to submit, then

click to make a pdf

If that doesn't work, use your browser's print function and save as a pdf

D3