**Partial Derivatives Activity** ____ **Name:** _____

**Activity Setup:** Your group has a surface that is the graph of a function of two variables we'll call $f$. Write the uppercase letter shown on your surface in the blank to the left of your name above.

Mark the sides of your surface to show your choice for the direction of the positive $x$- and positive $y$-axes. Be sure your choice will result in the positive $z$-axis pointing upward (in a right-hand coordinate system).

**Activity Tasks:** Locate points with the following properties on your surface. Use the marker to draw a point there and label it with the corresponding number below.

After finding the location of a point with the specified properties, write a "non-mathy" description of what the surface is doing at the corresponding point. (For example: downhill in the positive $x$-direction or as another example, sloping down in the positive $x$-direction ).

1. a point where $f_x > 0$ and $f_y < 0$

_____

2. a point where $f_x > 0$ and $f_y > 0$

_____

3. a point where $f_x$ is a small positive number

_____

4. a point where $f_y$ is a large negative number

_____

5. a point where $f_x = 0$ and $f_y \neq 0$

_____

6. a point where $f_x = 0$ and $f_y = 0$

_____

7. a point where $f_{xx} > 0$ and $f_{yy} > 0$ or where $f_{xx} < 0$ and $f_{yy} < 0$ (Circle which you used)

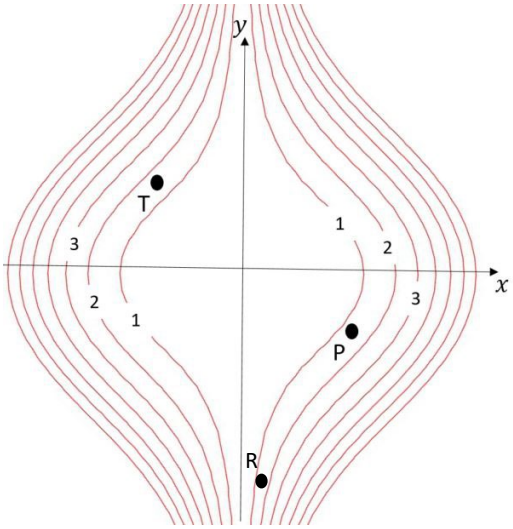
_____

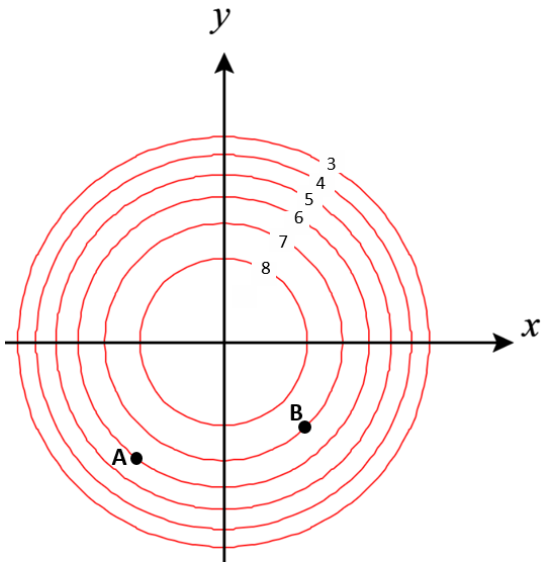
8. a point where $f_{xx} > 0$ and $f_{yy} < 0$

_____

Developed by Shelby Stanhope and Paul Seeburger for Taking CalcPlot3D to the Next Dimension, NSF – IUSE #2121152
These materials can be accessed at: https://sites.monroecc.edu/multivariablecalculus/3d-learning-activities/

**Contour Plot Activity:** Below are the contour plots for two functions of two variables, with contour elevations labeled. At each of the labeled points, determine if $f_x$ and $f_y$ are positive, negative, or zero.




**Follow up questions:**

1. Which quantity is larger $f_x(P)$ ***or*** $f_x(R)$? Why?

2. What is the sign of $f_{xx}(T)$? Explain why you think this is likely.

3. In the graph on the right, mark a point $M$ such that $f_y(M) = 0$.

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