

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 3D-printed 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 is a small positive number

2. _____
a point where f_y is a large negative number

3. _____
a point where $f_x > 0$ and $f_y < 0$

4. _____
a point where $f_x > 0$ and $f_y > 0$

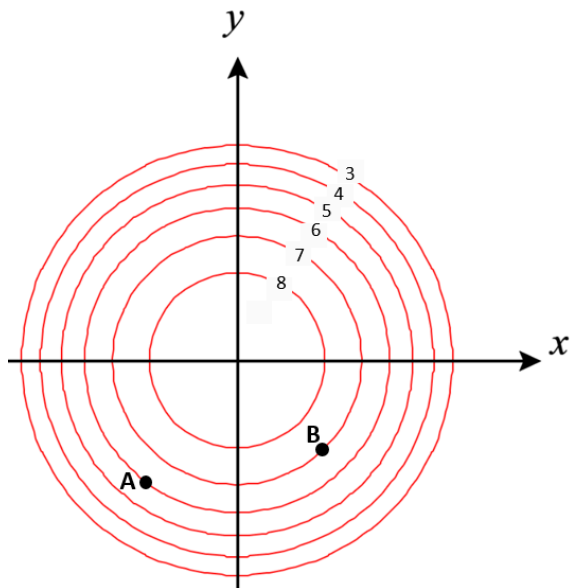
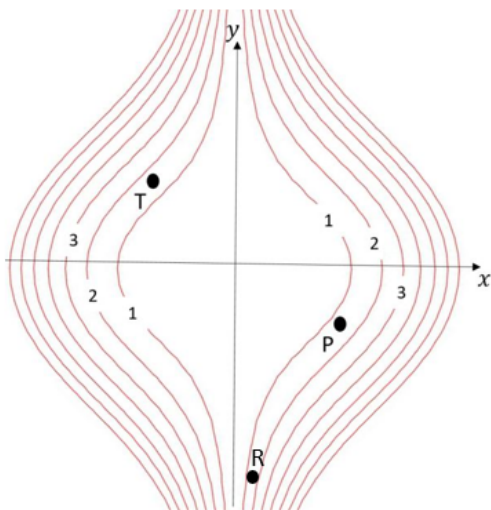
5. _____
a point where $f_x = 0$ and $f_y \neq 0$

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 $f_{yy} < 0$

Contour Plot Activity: Below are the contour plots for two functions of two variables, with contour elevations labeled.



1. At each of the labeled points, determine if f_x and f_y are positive, negative, or zero.

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

3. In the graph on the left, which quantity is larger $f_x(P)$ or $f_x(R)$? Why?

4. In the graph on the right, mark a point M (not at the origin) such that $f_y(M) = 0$.