Lab05 - Partial derivatives - part 2/2

[Your name(s) here...]

We've been working with the function defined (in function syntax) below, and evaluating partial derivatives at (x, y)=(π/2,1).

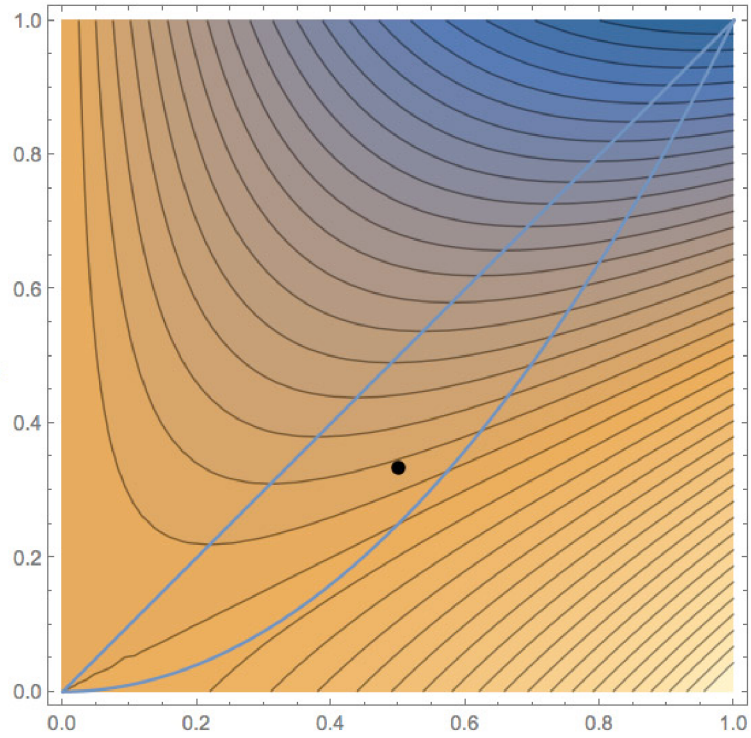
```
z[x_, y_] := y Cos[x y^3]
```

Your next step will be to make a contour plot of this function, and then estimate some of the second derivatives of the function. Here, for you reference, is the picture of the heat-seeking kitten contour plot, which will serve as an example of some of the things you can do to complete this lab:

In[1]:=
```
myT = x^2 - 2 x y;
myCP = ContourPlot[myT, {x, 0, 1}, {y, 0, 1}, Contours → 40];
myPoint =
  Graphics[{PointSize[Large], Black, Point[{1 / 2, 1 / 3}]}];
myBound = Plot[x, {x, 0, 1}];
Thickness[0.05]
myQuad = ParametricPlot[{t, t^2}, {t, 0, 1}];
Show[myCP, myPoint, myBound, myQuad]
```

Out[5]=
```
Thickness[0.05]
```

Out[7]=



Problem 5 4 pts

Using your single variable plots (**Problem 2**, from part 1 of this lab), estimate visually whether these second derivatives (related to the *curvature* of your graph) are positive, negative, or zero:

$f_{xx}(\pi/2, 1)$?

$f_{xx}(1, 1)$?

$f_{yy}(\pi/2, 1)$?

$f_{yy}(\pi/2, 1/2)$?

Problem 6 4 pts

Make a contour plot of $z(x, y)$. See the kitten example for how to place a dot on your contour plot. Include a dot at the coordinate $(x, y) = (\pi/2, 1)$.

Using your contour plot, estimate visually whether these second derivatives are positive, negative, or zero:

$f_{xy}(\pi/2, 1)$?

$f_{yx}(\pi/2, 1)$?

Problem 7 4 pts

To take a 2nd derivative in Mathematica you can “chain” D[...] functions together. For example, taking the partial derivative of a function with respect to *x* or *y*. And then taking the derivative of *that* with respect to *x* or *y*.

Use Mathematica to calculate the following second derivatives exactly and compare to your visual estimates above.

$f_{xx}(\pi/2, 1)$?

$f_{yy}(\pi/2, 1)$?

$f_{xy}(\pi/2, 1)$?

$f_{yx}(\pi/2, 1)$?