Lab05 - Partial derivatives - part I

[Your name(s) here...]

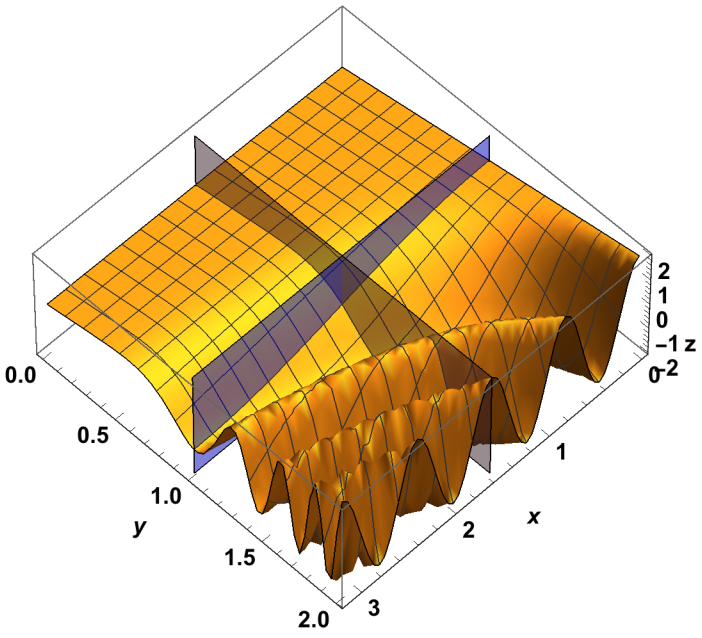
A partial derivative of a multivariable function is a derivative with respect to one of the variables, while holding the other variables constant.

If z is a function of two variables-- $z = z(x, y)$ -- then holding y constant, for example, $y = 1$, leaves us with a function that depends on only one variable: $z(x, 1.0)$. This is a "vertical" trace of the function. It's the intersection of the surface $y = 1$with the surface given by $z(x, y)$.

Below, a surface is plotted together with the planes $x = \pi/2$ and $y = 1$.

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

plot1 = Plot3D[  z[x, y],
    {x, 0, π}, {y, 0, 2}, ViewPoint → {10, 10, 20},
    AxesLabel → {x, y, "z"}, LabelStyle → Directive[Bold, Medium]];
plot2 = Graphics3D[
    {Opacity[.5], Blue, Polygon[{{0, 1, -2}, {0, 1, 2}, {π, 1, 2}, {π, 1, -2}}],
     Gray, Polygon[{{π/2, 0, -2}, {π/2, 0, 2}, {π/2, 2, 2}, {π/2, 2, -2}}]}];
Show[
 plot1,
 plot2]
```



Problem 1 4pts

Rotate the plot above as needed, and make a hand sketch of the function z(x,1). Think carefully about identifying the *positive* direction for the independent variable x!

Rotate the plot above as needed, and make a hand sketch of the function $z(\pi/2,y)$.
(Insert a snapshot of your sketches)

Problem 2 2pts

Now, use Mathematica's Plot[...] function to plot each of the 2 functions above. (And then see how well your hand sketches worked out.) Think carefully about identifying the *positive* direction for the independent variable y!

Problem 3 4 pts

Calculate the functional form of $f_x$and $f_y$by hand, and then evaluate $f_x(\pi/2, 1)$ and $f_y(\pi/2, 1)$. (Insert a snapshot of your calculations).

Problem 4 2pts

Using Mathematica, Calculate $f_x$and f_y, using **D[... , x]** and **D[... , y]** functions and evaluate $f_x(\pi/2, 1)$ and $f_y(\pi/2, 1)$.