Multivariable Calculus Quiz 6

Due Thursday 11/5 12:00 p.m.

Please show all work to receive full credit.

Don't forget that the timer on Gradescope includes time needed to scan and submit your work!

Time limit: 37 minutes

Problem 1 (4 pts)

Find parametric equations for the tangent line to the curve of intersection of the paraboloid $z = x^2 + y^2$ and the ellipsoid $4x^2 + y^2 + z^2 = 9$ at the point $(-1, 1, 2)$. (Hint: it is not necessary to actually find the curve of intersection)

Problem 2 (2 pts)

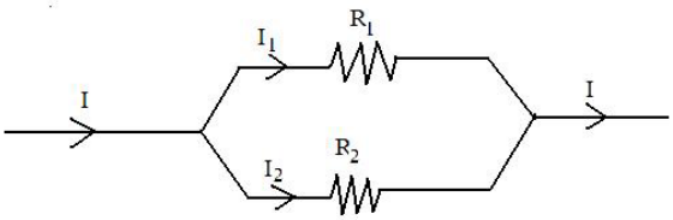
Consider the function $T(x, y, z) = x^2 + 2y^2 + 2z^2$, and let P be the point $(1, 1, 1)$. In which directions (there are a lot) from P does the value of the function not change?

Problem 3 (4 pts)

An electric current I flowing through a resistor with resistance R results in *energy loss* given by

$$\text{energy loss} = I^2 R.$$

Suppose we have the following situation:



where I is split into two currents I_1 and I_2 (and so they add up to the total current I), flowing through resistors with resistance R_1 and R_2 respectively. Determine what choice of I_1 and I_2 will minimize the total energy loss.