

TMATH 126: Quiz 3

You may use any work of yours that you made from last week. This includes, practice problems from the book and worked out WebAssign problems. This *does not* include photocopies of notes from the book or tutorials shown on WebAssign. You may also use a calculator, but you are not allowed to use any device that can access the internet.

Show *all* your work (numerically, algebraically, or geometrically) for each and simplify. No credit is given without supporting work.

1. [6] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true and provide a brief justification. Otherwise, circle F and provide a counterexample.

Recall that \cdot refers to the dot product, and \times refers to the cross product.

T F To prove that a statement is true, I need only show an example.

T F Let f and g be functions of x and y . The ordered pair (a, b) is a maximum or minimum if the vector $\nabla f(a, b)$ is parallel to $\nabla g(a, b)$.

T F The system of equations below has two equations and two unknowns, but we cannot solve for x or y .

$$0 = -6x(x^2 + y^2)e^{y^2-x^2} + 6xe^{y^2-x^2}$$

$$0 = 6y(x^2 + y^2)e^{y^2-x^2} + 6ye^{y^2-x^2}$$

2. The base of an aquarium with given volume of 400 ft^3 is made of slate and the sides are made of glass. The slate costs three times as much (per unit area) as glass (there is no top). We want to minimize the cost of the materials.
- (a) [2] Determine the function that you would like to minimize as a function of the dimensions of the aquarium. Be sure to clearly define your variables if you create them.
- (b) [2] Determine any constraints that this problem has.
- (c) [4] Set up the system of equations to find the minimum, but *do not* solve them.
3. [6] Use Lagrange multipliers to find the maximum and minimum values of the function $f(x, y) = x^2y$ subject to the constraint $x^2 + 2y^2 = 6$.