Take Home Exam # 3

Math 32.1

due: Monday, 4.11.16 @ 9:00 am

Directions

Failure to follow the directions will result in a lower score.

- Submit your solutions to this Take Home exam using separate pieces of paper.
- Be sure to write clearly and legibly. Expectations on the quality of work are higher because this is a take-home exam.
- Vectors are in **bold**.
- Decimal approximations will be marked as incorrect.
- Put your name on all sheets of paper submitted. I am not responsible for lost or missing sheets.

Questions

1. Sketch the domain of the function $f(x, y) = \sqrt{x^2 - xy}$.
2. True or False: level curves of a function can intersect. Give an example supporting your response.
3. Consider the expression $xz = \sin^{-1}(x + y)$ and the point $P\left(\pi, \dfrac{\sqrt{3} - 2\pi}{2}, \dfrac{1}{3}\right)$.
   (a) Using implicit differentiation, find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$ at P.
   (b) Find the plane tangent to the surface described by the expression above at P.
4. Find a function, $f(x, y, z)$, such that

$$D_{\mathbf{u}} f = -3$$
$$D_{\mathbf{v}} f = \sqrt{2}$$
$$D_{\mathbf{w}} f = 3$$

where $\mathbf{u} = \dfrac{1}{\sqrt{3}}\langle 1, 1, 1\rangle$, $\mathbf{v} = \dfrac{1}{\sqrt{2}}\langle 1, 0, -1\rangle$, and $\mathbf{w} = \dfrac{1}{\sqrt{3}}\langle 1, -1, 1\rangle$.