MATH 392 Quiz 2B

February 4, 2019

Name: _____

Instructions: No calculators! Use your own scrap paper and write your answers in the space provided.

1. Let $\vec{r}(t) =< x(t), y(t), z(t) >$, $f(x, y, z)$ be a scalar function, and $P(x_1, y_1)$ and $Q(x_2, y_2)$ be points in $\mathbb{R}^2$. Complete the following rules with vector functions:

   (a) $\vec{r}\,'(t) =$ _____

   (b) $\nabla f =$ _____

   (c) Line segment $\overrightarrow{PQ} =$ _____ (include limits)

2. (a) (2 points) Sketch the region bounded by $z = 8 - x^2 - y^2$ and $z = x^2 + y^2$.

   (b) Parametrize the curve of intersection, $\vec{r}_i(t)$, of the above two surfaces. Set up the limits so that the curve is traversed once.

   $\vec{r}_i(t) =$ _____ Limits: _____ $\leq t \leq$ _____

3. (a) Parametrize the line segment from (-1,1,2) to (2,2,-3): $\vec{r}_l(t) =$ _____

   (b) What is the length of the above line? $L =$ _____

4. Find a unit vector that is orthogonal to both $< -1,2,0 >$ and $< 3,4,-2 >$. $\vec{u} =$ _____

Bonus:

1. Let $C = \vec{r}(t)$ and f be as in problem 1. Find formulas for:

   (i) The length of $\vec{r}(t)$ for $a \leq t \leq b$: $L =$ _____

   (ii) $\int_C f\, ds =$ _____

2. Compute the length of $\vec{r}(t) =< \sqrt{7}, \sin^2 t, \cos^2 t >$ for $0 \leq t \leq \frac{\pi}{4}$:

   Integral Set-up: _____, Answer: _____