Math. 302-03
Fall, 2014
R. B. Kearfott

Fifth Examination
Friday, October 31, 2014

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this exam sheet. Each entire problem is worth 25 points.

1. Find a parametrization for the portion of the circle

$$x^2 + y^2 = 4$$

in the second quadrant traversed counter-clockwise. Also, draw the curve segment, showing the direction with an arrow.

2. Find the coordinates where the line

$$\vec{r}(t) = (1 + t, 1 - t, 1 + 2t)$$

intersects the y-z plane.

3. Compute the length of the portion of the spiral

$$\vec{r}(t) = (3\cos(t), 3\sin(t), 4t)$$

for $0 \leq t \leq 1$.

4. Sketch the portion of the vector field that is the gradient of $f(x, y) = x^2 + y^2$ for $-1 \leq x \leq 1$ and $-1 \leq y \leq 1$.