Math. 302-06
Fall, 2018
R. B. Kearfott

Second Examination

Tuesday, October 9, 2018

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 problem is worth 16 points, and 4 points are free.

1. Write down a vector equation for the line segment from the point $P(1, -1, 2)$ to the point $Q(3, 3, 3)$; include the limits on the parameter value.

2. Find parametric equations for the line tangent to the graph of $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$ at $t = 1$.

3. Sketch the level curves (contours) $f(x, y) = c$ corresponding to $c = -1$, $c = 0$, $c = 1$, and $c = 2$ of the function $f(x, y) = x^2 - y^2 + 1$. Label each contour and label the points where the contours cross the axes.

4. Find $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$, and $\frac{\partial f}{\partial z}$, where $f(x, y, z) = xe^{xyz} + yz^2$.

5. If $f(x, y, z)$ is differentiable at the point $(1, 2, 3)$, with $f(1, 2, 3) = 4$, $f_x(1, 2, 3) = -1$, $f_y(1, 2, 3) = 2$, and $f_z(1, 2, 3) = 1$, estimate $f(0.9, 2.1, 3.1)$.

6. Use the chain rule for functions of three variables to find the rate of change of $f(x, y, z) = x^2y + y^2z + z^2x$ at the point on the path $\mathbf{r}(t) = \langle t, t^2, t^3 \rangle$ when $t = 1$.