DATE: October 18, 2011

DEPARTMENT & COURSE NO: MATH 2130
COURSE: Engineering Mathematical Analysis 1

TIME: 1 hour
EXAMINERS: Lui, Williams

[4] 1. Given the parametric equation of a line: $x(t) = 1 + 2t,\ y(t) = -1 + 3t,\ z(t) = t$. Find the length of the line segment between the points defined by $t = 0$ and $t = 2$.

[4] 2. Find all values of the constant α so that the line defined by $\frac{x-1}{\alpha} = y = z + 1$ is parallel to the plane $4x + 5z + 4 = 0$.

[4] 3. Given the vector equation of a curve $\mathbf{r}(t) = (2, 3t, 5t^2)$. Set up but DO NOT EVALUATE an integral for the length of the curve between the points $(2, 0, 0)$ and $(2, 6, 20)$.

[4] 4. Let $f(x, y) = \begin{cases} \alpha, & (x, y) = (0, 0); \\ \frac{\sin(3x + 6y)}{x + 2y}, & (x, y) \neq (0, 0). \end{cases}$ Find the value of α so that f is continuous at $(0, 0)$.

[4] 5. Evaluate $\lim\limits_{(x,y)\to(0,0)} \frac{2x^2 + y^2}{x^2 + y^2}$.

[4] 6. Let $f(x, y) = \sin(x^2 + e^{3y})$. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial^2 f}{\partial x \partial y}$.

[6] 7. Let $z = xyt + 3xy^2,\ x = t + e^t,\ y = t\sin t$. Find $\frac{dz}{dt}$. Write your answer as a function of t alone. There is no need to simplify.

[8] 8. Find the distance between the line $\frac{x-1}{2} = \frac{y}{3} = \frac{z+1}{4}$ and the line with vector equation $\mathbf{r}(t) = (1, 2, 3) + t(4, 6, 8)$.

[12] 9. Sketch the surface $y^2 - 2x^2 - 2z^2 + 1 = 0$. Find parametric equations for the curve given by the intersection of the above surface and the plane $y + z = 0$. The curve is oriented in the clockwise direction when viewing from $(0, 10, 0)$.