NAME:

PRACTICE TEST 1 FOR MATH 2551 F1-F4, SEPTEMBER 20, 2018

This test should be taken without any notes and calculators. Time: 50 minutes. Show your work, otherwise credit cannot be given.

Problem 1: Compute the volume of the parallelepiped spanned by the vectors

$$\langle 1,2,2\rangle \ , \langle 2,1,-2\rangle \ , \ \langle 1,1,1\rangle$$

Problem 2: Find the distance between the point $(1,2,3)$ and the plane

$$x+2y+3z=6 \ .$$

Problem 3: Given the curve

$$\vec{r}(t)=\langle e^t,t,t^2\rangle \ , t\in\mathbb{R} \ .$$

Find the line tangent to the curve at the point $\langle e,1,1\rangle$, i.e., at $t=1$.

Problem 4: A particle has the trajectory

$$\vec{r}(t)=\langle t^2/2,t,e^t\rangle$$

Find the tangential acceleration a_T, the normal acceleration a_N as well as $\vec{T}$, $\vec{N}$ and $\vec{B}$.

Problem 5: Calculate the arc length of the curve $\vec{x}(t)=\langle t^2,t^3\rangle$ where t ranges from 0 to 1.

Problem 6: A real valued function $f(\vec{x})$ on some domain $D\in\mathbb{R}^2$ satisfies the inequality

$$|f(\vec{x})-f(\vec{x}_0)|\leq 2\sqrt{|\vec{x}-\vec{x}_0|}$$

for all $\vec{x}\in D$ where $\vec{x}_0$ is some fixed point in D. For any given $\varepsilon>0$ find $\delta>0$ so that

$$|f(\vec{x})-f(\vec{x}_0)|<\varepsilon$$

whenever $|\vec{x}-\vec{x}_0|<\delta$.

Problem 7: Consider the function

$$f(x,y,z)=\frac{1}{\sqrt{x^2+y^2+z^2}} \ .$$

For $(x,y,z)\neq(0,0,0)$ compute f_x, f_y, f_z and $f_{xx}+f_{yy}+f_{zz}$.

Problem 8: Sketch the level curve of of the function $\sqrt{x+y^2-3}$ that passes through the point $(3,-1)$.