MATH 2110

Test # 2

October 13, 2011

Name:_____

You must **show all work** to receive full credit. All problems are 10 points each.

1. Given
$$\mathbf{r}(t) =< 2\sin t, 5t, 2\cos t >$$
find the following.
   (a) the arclength parameterization of the curve
   (b) the curvature of the curve
   (c) the normal to the curve

2. Find the linear acceleration of the curve
$$\mathbf{r}(t) =< t^2, t^2, t^3 >$$

3. Find
$$\lim_{(x,y)\to(3,1)} \frac{xy - 3y - x + 3}{x^2y^2 - x^2 - 9y^2 + 9}$$

4. Determine if the following limit exists. If it does, calculate the limit. If it does not exist, show two paths along which the limit has different values.
$$\lim_{(x,y)\to(0,0)} \frac{xy}{x^2 + y^2}$$

5. Find and sketch the domain of the function
$$f(x,y) = \sqrt{x+y} - \sqrt{x-y}$$
and determine if the domain is open, closed or neither; bounded or unbounded; and connected or not connected.

6. Find f_x, f_y, and f_{xy} for
$$f(x,y) = \ln\left(\sqrt{x^2+y^2}\right)$$

7. Find the solution of
$$2yu_x + u_y = 0$$

8. Find the equation of the tangent plane to $z = f(x,y)$ where
$$f(x,y) = x^2 + y^2 + 4y$$
at the point (0,1).

9. Find the quadratic approximation of
$$f(x,y) = xe^y$$
at the point (1,0).

10. Find $\frac{\partial z}{\partial v}$ where $z = \cos(xy) + y\cos x$, $x = u^2 + v$ and $y = u - v^2$.