Math 3435 **Homework Set 2** **10 Points**

Arc Length

1. Find the arc length of $\vec{r}(t) = \left\langle \mathbf{e}^{2t}\cos(3t), -4, \mathbf{e}^{2t}\sin(3t) \right\rangle$ on $0 \le t \le 4$.

Limits

Find each limit, if it exists, or show that it doesn't exist.

2. $\lim\limits_{(x,y)\to(0,0)} \dfrac{\mathbf{e}^{x^2-y^2}}{3x+7y-5}$

3. $\lim\limits_{(x,y)\to(0,0)} \dfrac{(y-3x)^3}{2y^3+5x^3}$

4. $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^6 y}{3y^2-x^{12}}$

Partial Derivatives

For problems 5 – 7 find all the first derivatives.

5. $g(x,y,z) = x^2 y\, z^3 - \ln(2x-3z) + \cos^3(4x)$

6. $w = \sin(x-z)\mathbf{e}^{2x-y^2}$

7. $f(u,v,s,t) = s^2 \ln\left(\dfrac{4u}{v}\right) + \tan\left(u^2+4s\right)$

8. Use implicit differentiation to find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$ for the following function.

$$z^2 + \sec(3y) = x^2\mathbf{e}^{3+4z}$$

Higher Order Deriviatves

For problems 9 and 10 find all four second derivatives.

9. $z = x + 3y^4 - \ln(xy)$

10. $h(u,v) = \mathbf{e}^{u^2v^2} - \dfrac{3v}{u}$

For problems 11 and 12 find the indicated derivatives.

11. $f(u,t) = \sin\left(u+t^2\right) + t\left(u^2-u^{10}\right)^9$ find f_{utut}

12. $u = z^4 y^{-2}\sqrt[3]{x^2} + \ln\left(\dfrac{zy}{x}\right)$ find $\dfrac{\partial^5 u}{\partial x \partial z \partial y^2 \partial x}$