Math 2415 **Set 2** **10 Points**

Arc Length

1. Find the arc length of $\vec{r}(t) = \left\langle \ln\left(t^3\right), \sqrt{6}\,t, \tfrac{1}{2}t^2 \right\rangle$ on $1 \le t \le 10$.

Limits

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

2. $\displaystyle\lim_{(x,y)\to(0,0)} \frac{\cos(x) - \sin(y)}{xy + x^2 - y^2 + 4}$

3. $\displaystyle\lim_{(x,y)\to(0,0)} \frac{(7x - 4y)^3}{2y^3 + x^3}$

4. $\displaystyle\lim_{(x,y)\to(0,0)} \frac{x^4 y^2}{2x^{12} + 6y^3}$

Partial Derivatives

For problems 5 – 7 find all the first derivatives.

5. $g(x,y,z) = \dfrac{y^3 z^2}{x^4} + \sqrt{4z + 2x} - \cos^3(7y)$

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

7. $f(u,v,s,t) = u^2 \ln\left(s^2 - 8t^4\right) + \tan(4u)$

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

$$y^2 z^4 + \tan(1 - x) = 3z^6 + 1$$

Higher Order Deriviatves

For problems 9 and 10 find all four second derivatives.

9. $z = \ln\left(\dfrac{x}{2y}\right) + y^2 x^6 - 4y$

10. $h(s,t) = \cos\left(t^3 s^4\right) + \dfrac{s^4}{t^2}$

For problems 11 and 12 find the indicated derivatives.

11. $f(s,t) = t^6\sqrt{1 - 2s} + \left(t^6 + t^4 - t^2 - 1\right)^8$ find f_{ttstt}

12. $u = \dfrac{x^4\sqrt{y^3}}{z} + x^3 z^7 y^2$ find $\dfrac{\partial^6 u}{\partial y \partial x^2 \partial y \partial z^2}$