

Arc Length

1. Find the arc length of $\vec{r}(t) = \left\langle 7, e^{-4t} \sin\left(\frac{t}{2}\right), e^{-4t} \cos\left(\frac{t}{2}\right) \right\rangle$ on $1 \leq t \leq 6$.

Limits

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

2. $\lim_{(x,y) \rightarrow (0,0)} \frac{5 - x + 8y}{x^2 + y^2 - 8xy + 2}$

3. $\lim_{(x,y) \rightarrow (0,0)} \frac{6y^4 + x^4}{(2x - 7y)^4}$

4. $\lim_{(x,y) \rightarrow (0,0)} \frac{3xy^4}{2x^2 + 5y^8}$

Partial Derivatives

For problems 5 – 7 find all the first derivatives.

5. $g(x, y, z) = x^4 y^2 z + \sin(8z - y^2) + \cos^3(x^2)$

6. $w = (z^2 - x)e^{8y^2 - x^2}$

7. $f(u, v, s, t) = u^4 \ln\left(\frac{s}{3v}\right) + \sec(u^2 v^3)$

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

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

Higher Order Derivatives

For problems 9 and 10 find all four second derivatives.

9. $z = \sqrt{y^3 - x^2} - \ln(xy)$

10. $h(u, v) = e^{u^2 v^2} + \frac{8u}{v}$

For problems 11 and 12 find the indicated derivatives.

11. $f(t) = 6t^4 - u^3 t^{20} + u \cos(9t^5 + 8t^3 - 14t^2 + t - 1)$ find f_{ttuut}

12. $u = 8x^4 y^{-3} z^2 + \ln\left(\frac{y}{zx}\right)$ find $\frac{\partial^5 u}{\partial x^2 \partial z \partial y \partial z}$