Worksheet 17: Linear Approximation & Differentials

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1. Find the linearization of $f(x) = \sin(x)$ at $a = \frac{\pi}{2}$.

2. Find the linearization of $f(x) = x^{\frac{3}{4}}$ at $a = 16$.

3. Find the differential of each function:

   (a) $y = \frac{t^2}{1-t^5}$

   (b) $y = e^x \cos^{-1}(x^2)$

4. Use a linear approximation or differentials to estimate the given number:

   (a) $e^{-.01}$

(b) $\frac{1}{4.001}$

(c) $\sqrt{99.9}$

5. The radius of circular disk is given as 24 cm with a maximum error in measurement of .2 cm. Use differentials to calculate the maximum error in the calculated area of the disk; what is the relative error?

6. ($\star$) Is there any difference between the approximation given by a differential and the approximation given by a linearization? Why or why not?