

Linear Approximations and Differentials- HW Problems

1. Use the linear approximation of $f(x) = \sqrt[3]{x}$ at $a = 8$ to approximate $\sqrt[3]{8.1}$ and $\sqrt[3]{7.9}$.

2. Show that the linear approximation of $f(x) = \tan(x)$ at $a = 0$ is $L(x) = x$.

3. Use linear approximations to approximate:
 - a. $(2.001)^4$
 - b. $(8.04)^{\frac{2}{3}}$

4. Find the differential dy of each of the following functions.
 - a. $y = \sec(\sqrt{x})$
 - b. $y = \frac{x}{1+x}$

5. The radius of a circular disk is measured as 6 in. with a maximum error of 0.3 in.
 - a. Estimate the maximum error in the calculated area of the disk.
 - b. Estimate the maximum error in the calculated circumference of the disk.
 - c. What is the maximum percentage error in the area of the disk?

6. The surface area of a sphere ($SA = 4\pi R^2$) is measured as 500 in^2 with a maximum error of 2 in^2 .

a. Estimate the maximum error in the calculated volume (Hint: one way to do this is to find a formula for the volume of a sphere in terms of its surface area.).

b. What is the maximum percentage error?