Rutgers University
Math 151

Section 3.11: Linear Approximations - Worksheet

1. Use a well-chosen linear approximation to estimate the following quantities.

   (a) $\sqrt[3]{62}$

   (b) $e^{-0.8}$

   (c) $\sqrt{49.6}$

   (d) $\ln(1 + 5\sin(0.06))$

   (e) $\cot\left(\dfrac{\pi}{6} + 0.02\right) - \sqrt{3}$

   (f) $\sqrt[4]{17} - \sqrt[4]{16}$

2. Suppose that f is a function such that $f(3) = -7$ and $f'(3) = 2$. Use a linear approximation to estimate the following quantities.

   (a) $f(3.07)$

   (b) [**Advanced**] $f(1 + \cos(0.1) + e^{0.2})$

3. Find the differential dy of the following functions.

   (a) $y = \arcsin(3x^2)$

   (b) $y = 4\sqrt[3]{x} - \dfrac{5}{x^2} + e^3$

   (c) $y = \csc(5\theta)$

   (d) $y = 5^{3-t^2}$

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

   (f) $y = \sin(3e^{-7z})$

4. The volume of a sphere is computed by measuring its diameter.

   (a) Suppose that the diameter of the sphere is measured at 5 cm with a precision of 0.2 cm. What is the percentage error propagated in the computation of the volume?

   (b) [**Advanced**] Suppose that we want a measurement of the volume with an error of at most 1.5%. What is the maximum percentage error that can be made measuring the diameter?