Math 1300-005 - Spring 2017

Linearization and Linear Approximation - 3/14/17

Guidelines: This will not be handed in, but is a study resource for Midterm 3.

1. Find the linearization, $L(x)$, of each of the following functions at the given values of a.

   (a) $f(x) = x^4 + 3x^2, \quad a = -1$

   (b) $f(x) = \ln(x), \quad a = 1$

   (c) $f(x) = \cos(x), \quad a = \pi/2$

   (d) $f(x) = x^{3/4}, \quad a = 16$

2. In this problem, we shall estimate $e^{-0.015}$ using linear approximation. The idea is that -0.015 is very close to 0 and since we know the value of $e^0 = 1$, we can use the linearization of $f(x) = e^x$ at $x = 0$ to perform the estimate.

   (a) Let $f(x) = e^x$. Find the linearization, $L(x)$, of f at $a = 0$.

   (b) Use $L(x)$ to estimate $e^{-0.015}$. Is this an overestimate or underestimate? Please justify.

3. In this problem, we shall estimate $(8.06)^{2/3}$ using linear approximation. The idea is that 8.06 is very close to 8 and since we know the value of $8^{2/3} = (8^{1/3})^2 = 4$, we can use the linearization of $f(x) = x^{2/3}$ at $x = 8$ to perform the estimate.

   (a) Let $f(x) = x^{2/3}$. Find the linearization, $L(x)$, of f at $a = 8$.

   (b) Use $L(x)$ to estimate $(8.06)^{2/3}$. Is this an overestimate or underestimate? Please justify.