Math 180: Calculus I **Fall 2014**

November 4

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1. Use linear approximation to first find the derivative at $x = a$, then estimate f at the given point.
   (a) $f(x) = 12 - x^2$; $\quad a = 2, f(2.1)$
   (b) $f(x) = \ln(1 + x)$; $\quad a = 0, f(0.1)$
   (c) $f(x) = (8 + x)^{-1/3}$; $\quad a = 0, f(-0.1)$
2. Approximate the change in volume of a sphere when its radius changes from $r = 5$ to $r = 5.1$.
3. Find the differential $dy = f'(x)dx$ for
   (a) $f(x) = 3x^2 - 4x$
   (b) $f(x) = \sin^2 x$
4. Write a linear approximation equation L of f at a. Do linear approximations for x near a over-estimate or under-estimate? (*Hint*: Look at concavity)
   (a) $f(x) = \frac{2}{x}; a = 1$
   (b) $f(x) = \sqrt{2}\cos x; a = \frac{\pi}{4}$