

18.022 Practice Problems, 10/28/2013

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1.

- (a) Compute the second-order Taylor polynomial for the function $f(x) = \operatorname{atan} x$ at the point $x = 1$.

Note that an alternative way to phrase this problem would be the following: Compute the unique second-order polynomial $P(\Delta) = a_0 + a_1\Delta + a_2\Delta^2$ that agrees most closely with the function $f(\Delta) = \operatorname{atan}(1 + \Delta)$ for small values of $|\Delta|$.

- (b) Compute the second-order Taylor polynomial for the function $f(x, y) = y \operatorname{atan} x$ at the point $(x, y) = (1, 2)$. Find an alternative description of this polynomial in analogy with the alternative statement of the problem of part (a).

- (c) Compute the second-order Taylor polynomial for the function $f(x, y, z) = y \operatorname{atan} \frac{x}{z}$ at the point $(x, y, z) = (1, 2, \sqrt{3})$. Find an alternative description of this polynomial in analogy with the alternative statement of the problem of part (a).

2. (Colley problem 4.1.20) If you measure the radius of a cylinder to be 2 inches with an error of ± 0.1 inches and the height of the cylinder to be 3 inches with a possible error of ± 0.05 inches, give bounds for the experimental error in your determination of the cylinder's (a) volume, (b) surface area.