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**IN-CLASS ACTIVITY : LINEAR APPROXIMATION**

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1. What is the linear approximation of a function of the form  $f(x) = mx + b$ ?
2. Compute the linear approximations of the following functions at the given point
  - (a)  $f(x) = x + x^4$  at  $x = 0$ ;
  - (b)  $f(x) = \frac{1}{x}$  at  $x = 2$ ;
  - (c)  $f(x) = \sin(x)$  at  $x = \frac{\pi}{2}$ ;
3. Estimate, without a calculator, the following numbers :

(a)  $(2.001)^6$

(c)  $(15.99)^{\frac{1}{4}}$

(b)  $\cos(0.03)$

(d)  $\frac{1}{9.8}$

Compare your estimates with the exact values. Justify why the error is positive or negative by considering the concavity of the functions involved.

4. A spherical golf ball is measured to have a radius of 5mm with a possible error of 0.1mm. What is the possible change in volume?
5. An ice cream cone has height 4in and radius 1in. If the cone is 0.1in thick, what is, approximately, the difference between the volume of the cone (including the shell) and the volume of the ice cream you can fit inside the shell?