

**Homework 4**  
**Due Monday 3/7/2011 in class**

**Name:**

**Section Number:**

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**This cover sheet must be attached as the top page of your homework.**

1. Let  $f(x) = \cos(x)$ . Use linear approximation of  $f(x)$  to estimate the value of  $\cos\left(\frac{\pi}{2} + 0.01\right)$ .
2. Let  $g(x) = x^2 - 2$ . We looked at the Newton-Raphson method for finding roots (zeros) of a function. Do two steps of Newton-Raphson given the initial guess  $x_0 = 1$ . (I.e., starting with  $x_0 = 1$ , calculate  $x_1$  and  $x_2$ .)
3. Suppose that the edge lengths  $x$ ,  $y$ , and  $z$  of a closed rectangular box are changing at the following rates:

$$\frac{dx}{dt} = 1 \text{ m/sec}, \quad \frac{dy}{dt} = -2 \text{ m/sec}, \quad \frac{dz}{dt} = 1 \text{ m/sec}.$$

- (a) Find the rate at which the box's volume is changing at the instant when  $x = 4$ ,  $y = 3$ , and  $z = 2$ .
  - (b) Find the rate at which the box's surface area is changing at the instant when  $x = 4$ ,  $y = 3$ , and  $z = 2$ .
4. Coffee is draining from a conical filter into a cylindrical coffee pot at a rate of  $10 \text{ in}^3/\text{min}$ .
    - (a) How fast is the level in the coffee pot rising when the coffee in the cone is  $5 \text{ in}$  deep?
    - (b) How fast is the level in the cone falling at the same instant?