

Homework 4 - Math 1451-008 (Howle)
Due Monday 3/26/2012 in class

Name:

R Number:

This cover sheet must be attached as the top page of your homework.
See homework requirements in the syllabus.

1. Let $f(x) = \cos x$. Use linear approximation of $f(x)$ to estimate the value of $\cos(\frac{\pi}{2} + 0.01)$.
2. Let $g(x) = x^2 - 2$. Do two steps of the Newton-Raphson method starting with initial guess $x_0 = 1$.
3. Suppose that the edge lengths x, y, 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. Given the function $f(x) = 4x^3 - x^4$.
 - (a) Find all critical points of $f(x)$.
 - (b) Identify all intervals on which $f(x)$ is increasing and on which it is decreasing.
 - (c) Find the relative extreme values of $f(x)$.
 - (d) Identify all intervals on which $f(x)$ is concave up and on which it is concave down. Find any inflection points of $f(x)$.
 - (e) Sketch a graph of $f(x)$ clearly indicating and labeling the information found in parts (a) through (d).