

Practice Midterm #2

Name: _____

StudentID: _____

Major: _____

Time: 50 minutes.**Date:** Thursday, 2nd December 2010.

Justify your solutions and show all your steps. Write down formulae used. Answer each question on a separate sheet.

Number	1	2	3	4	5	6	7	Σ
Possible Points	5	5	5	2	3	5	5	30
Points								

1. During the 1999 episode of hyperinflation in Brazil, the price of food increased at a rate of 30 % per month. If your food bill was R\$ 100 one month during this period, what was it three month later?

2. Inflation is causing prices to rise at a rate of 12% per year.

Compare the doubling times found with the approximate and exact doubling time formulae. Then use the exact doubling time formula to answer the following question:

For an item that costs \$ 500 today, what will the price be in 4 years?

3. The pH scale is defined by the following equivalent formulas:

$$pH = -\log_{10}[H^+] \quad \text{or} \quad [H^+] = 10^{-pH}$$

where $[H^+]$ is the hydrogen ion concentration in moles per liter. Pure water is neutral and has a pH of 7. Acids have a pH lower than 7 and bases have a pH higher than 7.

Consider a situation in which acid rain has heavily polluted a lake to a level of pH 4. An unscrupulous chemical company dumps some acid into the lake illegally. Assume that the lake contains 100 million gallons of water and that the company dumps 100,000 gallons of acid with pH 2.

- (a) What is the hydrogen ion concentration, $[H^+]$, of the lake polluted by acid rain alone?
- (b) Suppose that the unpolluted lake, without acid rain would have pH 7. If the lake were then polluted by company acid alone (not acid rain), what hydrogen ion concentration, $[H^+]$ and pH would it have?
- (c) What is the hydrogen ion concentration, $[H^+]$, after the company dumps the acid into the rain-polluted lake (pH 4)? What is the new pH of the lake?
- (d) If the U.S. Environmental Protection Agency can test for changes in pH of only 0.1 or greater, could the company's pollution be detected?

4. *Does the following statement makes sense? Why or why not?*

I graphed a function showing how my heart rate depends on my running speed.
The domain was heart rates from 60 to 180 beats per minute.

5. The diameter of a tree increases by 0.2 inch with each passing year. When you started observing the tree, its diameter was 4 inches. Estimate the time at which the tree started growing.

6. Uranium-238 has a half-life of 4.5 billion years.
- (a) You find a rock containing a mixture of uranium-238 and lead. You determine that 65% of the original uranium-238 remains; the other 35% decayed into lead. How old is the rock?
 - (b) Analysis of another rock shows that it contains 45% of its original uranium-238; the other 55% decayed into lead. How old is the rock?

7. Three tennis balls fit perfectly when stacked in a cylindrical can. Which is greater: the circumference of the can or the height of the can?