Assignment 1
MATH 126, Fall term, 2010

Instruction:
1. Assignment can be done in groups of at most three students. Only one copy is needed for a group. Please make sure all names and student numbers are listed clearly on the assignment.
2. Assignment can be handed in in our class, in our tutorial or to my office at Jeff 413.
3. All assignments must be handed in before 2pm on Friday (Oct 15). Late assignment will not be accepted.
4. Show your calculation in details. Round your answer to two decimal places.

1. A house purchased for $255,000 is expected to double in value in 15 years.
   (a) Find a linear function that describes the value of the house after \( t \) years of purchase.
   (b) Find an exponential function that describes the value of the house after \( t \) years of purchase.

2. If a contractor’s price for an aircraft component is \( p \) dollars per unit, then a company will purchase \( q \) hundred units according to the demand equation \( p^2 + q = 104 \). When the price is \( p \) dollars per unit, the contractor is willing to supply \( q \) hundred units according to the supply equation \( 2p - q = 16 \).
   (a) determine the equilibrium price and equilibrium quantity.
   (b) If a tax of $1 per unit is to be imposed on the contractor, what is the new supply equation? Find the equilibrium price and equilibrium quantity if the demand remains the same.

3. The height (in meters) of a certain kind of tree is approximated by
   \[ h(t) = \frac{48}{1 + 240e^{-0.2t}} \]
   where \( t \) is the age of the tree in years.
   (a) Estimate the height of a 5 year old tree.
   (b) I brought a 3 meters tall tree, how long does it take for the height to double (i.e grow to 6 meters)?
   (c) How tall will a tree be eventually (that is when the time \( t \) increases without bound)?

4. Use the following graph to give approximate values of the following terms (if they exist).

   (a) Find \( x \) such that \( f(x) = 0 \).
   (b) \( \lim_{x \to -1} f(x) = \)
   (c) \( \lim_{x \to 0^-} f(x) = \)
   (d) \( \lim_{x \to 0^+} f(x) = \)
   (e) \( f(0) = \)
   (f) \( \lim_{x \to -1^-} f(x) = \)
   (g) \( \lim_{x \to -1^+} f(x) = \)
   (h) \( \lim_{x \to 1} f(x) = \)

5. Let \( f(x) = \frac{\sqrt{x + 1} - 1}{x} \). Find \( \lim_{x \to 0} f(x) \), \( \lim_{x \to -1} f(x) \) and \( \lim_{x \to \infty} f(x) \).