Math 220 – Homework 2

Due Thursday 1/31 at the beginning of class

Total points: 165

PART A

Problems from the textbook:

- Section 1.1

problem	15(a,b,e, g, h,i)	16(a,b,c,d,e)
points	30	50

PART B

1. [20 points] In each of the following statements identify the hypothesis (assumption) and conclusion. (Hint: In some cases you may express the given statement in a conditional form (If-then), and so discover its hypothesis and conclusion.)
   (a) In an isosceles triangle the angles at the base are equal.
   (b) If x or y are irrational, then $x - y$ is irrational.
   (c) A sufficient condition for a triangle to be isosceles is that it has two equal angles.
   (d) a^3 is an even integer whenever a is an even integer.
   (e) A necessary condition for voting is that you be 18 years old.
2. [4 points] Without changing its meaning, convert the sentence

   If a function has a constant derivative, then it is linear, and conversely.

   into a sentence having the form "P if and only if Q."
3. [25 points] Negate the following statements:
   (a) Every prime number is greater than 1.
   (b) There are sets that contain infinitely many elements.
   (c) There is a cold medication that is safe and effective.
   (d) The number p is prime or the number q is not prime.
   (e) If f is a linear function, then f is continuous at 0.
4. [25 points] Consider the implication *"If m and n are odd, then mn is odd."*
   (a) State the implication using "only if".
   (b) State the converse of the implication.
   (c) State the contrapositive of the implication.
   (d) State the implication as a disjunction.
   (e) State the negation of the implication as a conjunction.
5. Given a quantified statement
$$\forall a, b \in \mathbb{R}, (a < b) \Rightarrow (\exists r \in \mathbb{Q} \ni (a \leq r < b)). \tag{1}$$
   (a) [3 points] Express the statement (1) in words.
   (b) [8 points] Express the **negation** of the statement (1) in symbols. **(Do NOT use the symbol "$\notin$" and interval notation.)**