Serial #: _____ ID _____ NAME _____

Show all necessary steps for full marks.

Question 1: (5 points): Given $A=\left\{3,-2\frac{3}{4},\ \sqrt{3},\ \pi,\ 4.\overline{2},\ 3.1415,\ -\frac{2}{3},\ 0.1\overline{4},\ 1.31331333133331...,\ \sqrt{9},\ \frac{3}{\sqrt{2}}\right\}$

(a): List the rational numbers of the set A

(b): List the irrational numbers of the set A

Solution: **(a):** Rational Numbers: $3,-2\frac{3}{4},\ 4.\overline{2},\ 3.1415,\ -\frac{2}{3},\ 0.1\overline{4},\ \sqrt{9}$

(b): Irrational numbers: $\sqrt{3},\ \pi,\ .31331333133331...,\ \frac{3}{\sqrt{2}}$

Question 2: (5 points): List the 4 smallest element of each infinite set

$A=\{2x\mid x \text{ is a positive integer}\}$

$B=\{y\mid y=2x+1,\ x \text{ is a natural number}\}$

$C=\{y\mid y=x^2-1,\ x \text{ an integer}\}$

$D=\{n^2\mid n \text{ is a integer}\}$

Solution:
4 smallest elements of A are : 2, 4, 6, 8
4 smallest elements of B are : 3, 5, 7, 9
4 smallest elements of C are : -1, 0, 3, 8
4 smallest elements of D are : 0, 1, 4, 9

Because:

$A=\{2x\mid x \text{ is a positive integer}\}=\{2,4,6,8,10,.....\}$

$B=\{y\mid y=2x+1,\ x \text{ is a natural number}\}=\{3,5,7,9,11,13,.....\}$

$C=\{y\mid y=x^2-1,\ x \text{ an integer}\}=\{0^2-1,(\pm1)^2-1,(\pm2)^2-1,(\pm3)^2-1,(\pm4)^2-1,(\pm5)^2-1....\}$

$==\{0-1,\ 1-1,\ 4-1,\ 9-1,16-1,\ 25-1,.....\}=\{-1,0,3,,8,15,24,...\}$

$D=\{n^2\mid n \text{ is a integer}\}=\{0^2,(\pm1)^2,(\pm2)^2,(\pm3)^2,(\pm4)^2,...\}$

$=\{0,1,4,9,16,25,.....\}$

Question 3: (5 points): Write the following without absolute value symbols:

$|2x-12|-|x-2|$, $2<x<3$

Solution: $|2x-12|-|x-2|=-(2x-12)-(x-2)=-2x+12-x+2=-3x+14$

Question 4: (5 points): TRUE / FALSE?

(a): The set of irrational numbers is closed with respect to addition.

(b): The set $\{-1,0,1\}$ is closed with respect to multiplication.

(c): If x is any integer and y is any irrational number then x/y is irrational.

(d): The distributive law states that: $(a+b)+c=a+(b+c)$.

(e): Any irrational number has a terminating or repeating decimal expansion.

Solution: (a): False, since $-\sqrt{2}+\sqrt{2}=0\notin H$

(b): TRUE: The set $\{-1,0,1\}$ is closed with respect to multiplication.

(c): False, since $x=0\in I$ and $y=\sqrt{3}\in H$ but $\frac{0}{\sqrt{3}}=0\notin H$

(d): False, It is NOT distributive law.

(e): False, Any irrational number does not have a terminating and repeating decimal expansion.