## Homework Class Test

## Question 1. What is this document?

This is a demonstration of my homework LaTeX class. It is an extension of the amsart and should have all of its functionality. These are some of the set symbols:  $\mathbb{C} \supset \mathbb{R} \supset \mathbb{Q} \supset \mathbb{Z} \supset \mathbb{N}$ , then some Greek and other mathematical symbols are,  $\alpha, \varepsilon, \partial, \rightarrow, \Rightarrow, \hookrightarrow, \rightarrow, \rightarrow$ . We can also insert multiple figures as seen in figure 1. There is also an org-mode version of this file <sup>1</sup>.





the first quadrate, which is the square, and the two quadrangles on its sides, which are the ten roots, make together thirty-ristor. In order to complete the great quadrate, there wants only a square of five multiplied by five, or treaspride. This we add to thirty-ristor, in order to complete the great square S H. The sum is invited to complete the great square S H. The sum is invited to complete the great square S H. The sum is invited to the prost quadrangle. By subtracting from this the same quantity which we have before added, namely five, we obtain there as the remainder. This is the side of the quadrangle A B, which represents the quare it is the root of this square, and the square used it among the square to the figure.—

G E D

Demonstration of the Case: "a Square and twenty-one Dirhems are equal to ten Roots,"4

We represent the square by a quadrate A D, the length of whose side we do not know. To this we joint parallelogram, the breadth of which is equal to one o the quadrate A D, such as the side H N This parallelogram is H B. The insulation

FIGURE 1. Al'Khwarizmi

**Question 2.** Prove that  $\exists (x,y) \in \mathbb{Z}$  such that x+y=4.

*Proof.* Four is the sum of two integers.

 $1, 3 \in \mathbb{Z} \text{ and } 1 + 3 = 4.$ 

QED.

**Question 3.** What is the cardinality of Natural Numbers? It is  $\aleph_0$  [1]. See also question 99.

**Question 99.** Is the cardinality of Naturals and Reals the same because they are both infinite? No, the cardinality of Reals is greater because they are also un-listable (uncountable). See also question 3.

Question 4. Finally the numbered bullets are done with the enumitem package,

- 1) With just bullets,
  - Cats
  - Dogs

Bonus Question 1. State chain rule.

Chain Rule:

$$\zeta(x) = f(g(x))$$
 then according to the chain rule:  $\frac{\mathrm{d}\zeta}{\mathrm{d}x} = \frac{\mathrm{d}f}{\mathrm{d}g} \times \frac{\mathrm{d}g}{\mathrm{d}x}$ 

<sup>&</sup>lt;sup>1</sup>Tashfeen's org-mode configurations can be found here.

## Bonus Question 2. Euclidean Algorithm

You may write code as in listing 1,

```
1 def gcd(x, y): # x > y
    x0, x1, y0, y1 = 1, 0, 0, 1
    while (y > 0):
      print('\\gcd(%d, %def) &: %d &&= ' % (x, y, x), end='')
      q, r = divmod(x, y)
5
      # print('%d \\times %d + %d &&\\quad' % (q, y, r), end='')
6
      # print('[%d, %d] - %d[%d, %d] = ' % (x0, x1, q, y0, y1), end='')
8
      x0, x1, y0, y1 = y0, y1, x0 - q * y0, x1 - q * y1
9
      # print('[%d, %d] \\\' % (y0, y1))
10
11
    return x, x0, x1
```

LISTING 1. Euclidean Algorithm for Greatest Common Factor

## References

[1] Sandra Lach Arlinghaus and SL Arlinghaus. Part ii. elements of spatial planning: Theory. merging maps: Node labeling strategies. *Unknown*, 1996.

BAYT EL-HIKMAH