

## Homework in Org-mode

### Question 1. What is this document?

This is a demonstration of my homework L<sup>A</sup>T<sub>E</sub>X 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,  $\alpha, \varepsilon, \partial, \rightarrow, \Rightarrow, \Leftarrow, \rightarrow, \Leftrightarrow$ . We can also insert multiple figures as seen in figure 1. There is also an `org-mode` version of this file<sup>1</sup>.



FIGURE 1. Al'Khwarizmi

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

We show,

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

$1, 3 \in \mathbb{Z}$  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*

### Question (Bonus) 1. State chain rule.

Chain Rule:

$$\zeta(x) = f(g(x)) \quad \text{then according to the chain rule:} \quad \frac{d\zeta}{dx} = \frac{df}{dg} \times \frac{dg}{dx}$$

### Question (Bonus) 2. Euclidean Algorithm

You may write code as in listing,

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

```

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

```

LISTING 1. Euclidean Algorithm for Greatest Common Factor

**Question 5.** How do we insert in-file code?

Like in listing 2,

```

1 def fib(n):
2     if n == 0: return 0
3     if n == 1: return 1
4     return fib(n - 1) + fib(n - 2)
5 print(fib(20))

```

LISTING 2. Recursive Python function to calculate  $n^{th}$  Fibonacci number.

## REFERENCES

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

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