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CS 3141: Prof. Kamil's Algorithm Analysis
June 18, 2020

Homework Class Test

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, $\alpha, \varepsilon, \partial, \to, \Rightarrow, \hookrightarrow, \twoheadrightarrow, \hookrightarrow$. We can also insert multiple figures as seen in figure 1.

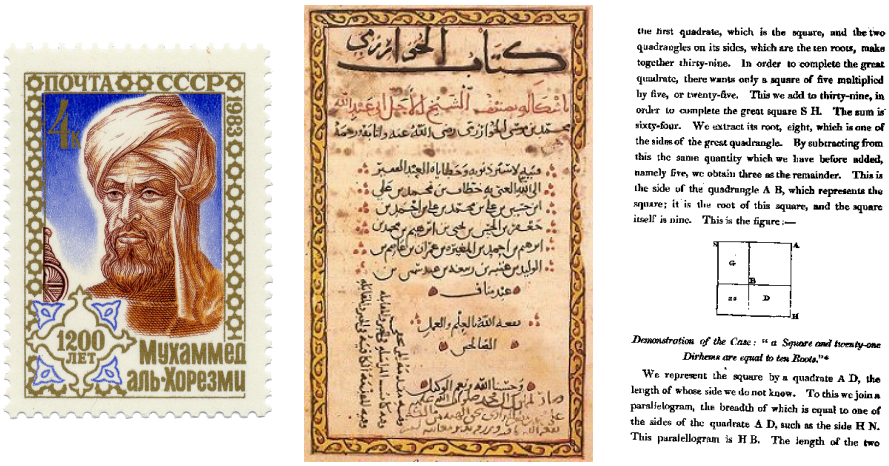

FIGURE 1. Al'Khwarizmi

Question 1. Prove that $\exists (x, y) \in \mathbb{Z}$ such that $x + y = 4$.

We show,

Proof. Four is the sum of two integers.

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

Bonus Question 1. Bonus Question Statement

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

Bonus Question 2. Euclidean Algorithm

You may write code,

```
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)
        # print('%d \\times %d + %d &&\\quad' % (q, y, r), end='')
        # print('[%d, %d] - %d[%d, %d] = ' % (x0, x1, q, y0, y1), end='')
        x, y = y, r
        x0, x1, y0, y1 = y0, y1, x0 - q * y0, x1 - q * y1
        # print('[%d, %d] \\\\' % (y0, y1))
    return x, x0, x1
```

Question 2. What is the cardinality of Natural Numbers?
It is $\aleph_0$.

Question 3. 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).

Question 99. Custom Numbering.
This question is numbered 99.

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

1) With just bullets,
   - **Cats**
   - *Dogs*