Prompt 3

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1 Elementary Number Theory

This proof based class covers mathematical induction, distribution of primes, congruences, Diophantine equations and divisibility of integers. So essentially, the theory of numbers.

Theorem 1 (4.6)**.** *If $a, b.c, d$ and m are integers such that $m > 0$, $s \equiv b \pmod{m}$, and $c \equiv d \pmod{m}$ then,*

1. $a + c \equiv b + d \pmod{m}$,
2. $a - c \equiv b - d \pmod{m}$,
3. $ac \equiv bd \pmod{m}$.

2 Mathematical Statistics

This class covers many topics in statistics such as distributions, expected values, moments, and probability, and uses calculus to do so.

Theorem 2 (Chebyshev's Theorem)**.** *If μ and σ are the mean and the standard deviation of a random variable X, then for any positive constant k the probability is* at least $1 - \frac{1}{k^2}$ *that X will take on a value with k standard deviations of the mean; symbolically*

$$P(|x - \mu| < k\sigma) \geq 1 - \frac{1}{k^2}, \sigma \neq 0$$

3 Applied Numerical analysis

In this class we approximate solutions to calculus like problems, which include: root finding, integration, differentiation, fixed point and others.

Theorem 3 (2.2)**.**

1. *If $g \in C[a, b]$ and $g(x) \in [a, b]$ for all $x \in [a, b]$, then g has a fixed point in [a,b] .*
2. *If, in addition, $g'(x)$ exists on (a,b) and a positive constant $k < 1$ exists with*

$$|g'(x)| \leq k,$$

$x \in (a, b)$,

then the fixed point in [a,b] is unique.