MATH 3320 REVIEW FOR EXAM I

A: Euclidean algorithm for \( \mathbb{N} \) and uniqueness of factorization
- \( \gcd(a, b) \) and continued fractions. page 286, 9-1 to 9-10.
- solving \( ax + by = c \). Rings and ideals. page 289, 9-11 to 9-13.
- number of steps in the Euclidean algorithm; Fibonacci numbers.
- powers of \( p \) dividing \( n! \). page 26, 1-51 to 1-57.
- perfect numbers. 7-1 to 7-8, 7-11, 7-12, 7-14.
- \( \tau(n) \) and \( \sigma(n) \). page 29, 1-68 to 1-84.
- Mersenne primes and Fermat primes. page 208, 7-17, 7-18.

B: Gaussian Integers.
- norm, the ring \( \mathbb{Z}[i] \).
- Euclidean algorithm, method of descent.
- units and primes. page 372, 11-1 to 11-16. 11-18 to 11-23.
- \( \gcd(a, b) \).
- the equation \( x^2 + y^2 = z \). page 379, 11-30.
- Pythagorean triples. page 237 8-2 to 8-5.

C: The equations \( x^2 + dy^2 = z \) and \( x^2 + dy^2 = z \) (\( d > 0 \)) and the rings \( \mathbb{Z}[\sqrt{-d}] \) and \( \mathbb{Z}[^d] \). Units. page 380, 11-32 to 11-37.

D: Continued Fractions. page 290, 9-14 to 9-18,
- Convergence.
- quadratic irrationals. Periodic and purely periodic fractions.
- Lagrange’s theorem. page 292, 9-22 to 9-38.
- Pell’s equation and units in \( \mathbb{Z}[\sqrt{d}] \). page 329, 10-1 to 10-2, page 332, 10-10 to 10-11, 10-17, 10-22, 10-26, 10-34.