Due: Sep 12 2024

- 1. (10 pts) Find the prime factorization of 25200.
- 2. (10 pts) Prove that $\sqrt{7}$ is irrational.
- 3. (10 pts) Prove: If n is an odd integer, $n^2 = 1 \mod 8$.
- 4. (10 pts) Prove: If the sum of the digits is divisible by 3, the number is divisible by 3.
- 5. (10 pts) Consider $z_1 = 3 + 4i$ and $z_2 = 2 i$. Compute $z_1 + z_2$, $z_1 z_2$, and z_1/z_2 . Solve the equation $z^2 = z_1$.
- 6. (10 pts) Let $a \equiv b$ if $a = b \mod 7$. Find [4].
- 7. (20 pts) Use Taylor series to prove $e^{ix} = \cos(x) + i\sin(x)$.
- 8. (20 pts) Use induction to prove that

$$\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$