Mathematics 300

Quiz 21 **Name:**_____

You must show your work to get full credit.

1. Prove: For any integer n, the number $n^3 + 3n^2 - n + 3$ is divisible by 3.

2. Prove or give a counterexample: For integers a and b, if $ab \equiv 0 \pmod 6$, then $a \equiv 0 \pmod 6$ or $b \equiv 0 \pmod 6$.

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4. Prove or give a counterexample: If $4 \mid a^2$, then $4 \mid a$.

5. Prove or give a counterexample: If $3 \mid a^2$, then $3 \mid a$.

6. Prove $\sqrt{3}$ is irrational. That is show if r is a real number with $r^2 = 3$, then r is irrational.