

Your Name:

Duration of the Quiz is 25 minutes. There are three problems, worth 20 points. Show all your work for full credit. Books, notes etc. are prohibited. Calculators are NOT permitted.

1. Let  $n$  be a positive integer.

(a) Use a direct proof to show that if  $n$  is odd, then  $5n + 6$  is odd.

(b) Use a proof by contraposition to prove that if  $5n + 6$  is odd, then  $n$  is odd.

2. Let  $x$  be a real number. Prove that if  $x$  is irrational, then  $3x + 2$  is irrational using a proof by contradiction.

3. Use mathematical induction to prove that

$$1 \cdot 2 + 2 \cdot 3 + \cdots + n(n+1) = \frac{n(n+1)(n+2)}{3}.$$