# Skill Mastery Quiz 6

Communicating in Math (MTH 210-01)
Winter 2020

Name:

P3-3 The following statement is incorrect:

For each integer $n$, if $n$ is odd, then $(n^2 + 1)$ is a prime number.

Show the statement is false using a counterexample. You should clearly explain why the counterexample you found shows the statement is false. (If you don't remember what a prime number is just ask!)

P1-2 Consider the following statement:

For all natural numbers $p$ and $q$, if $p$ and $q$ are twin primes other than 3 and 5 , then $pq + 1$ is a perfect square and 36 divides $pq + 1$.

State what you would assume in a direct proof.

State what you would assume in a proof by contradiction.

P4-1 Consider the following proposition and proof. Is the proof correct? If not, explain any major mathematical errors. If so, does the proof meet our writing guidelines?

**Theorem 1.** *If $a$ is an odd integer then $3a + 2$ is an odd integer.*

*Proof.* We will use a direct proof. For $3a + 2$ to be an odd integer there must exist an integer $n$ such that

$$3a + 2 = 2n + 1.$$

By subtracting 2 from both sides of this equation we obtain

$$\begin{aligned} 3a &= 2n - 1 \\ &= 2(n - 1) + 1. \end{aligned}$$

By the closure properties of integers, $n - 1$ is an integer, and hence, the last equation implies that $a$ is an odd integer. This proves that if $a$ is an odd integer then $3a + 2$ is an odd integer. $\square$