**Mathematics 174**

Quiz # 8 Name: Key

***You must show your work to get full credit.***

**1.** Define $d$ is a ***divisor*** of $n$ where $d$ and $n$ are integers.

$d \neq 0$ and $n = k(d)$ for some integer $k$.

(I will take $n = (\text{integer})d$.

**2.** Show that if $n$ is odd that $n^2 - 1$ is divisible by 4.

If $n$ is odd then $n = 2k+1$ for some integer $k$. Thus

$$\begin{aligned} n^2 - 1 &= (2k+1)^2 - 1 \\ &= 4k^2 + 4k + 1 - 1 \\ &= 4(k^2 + k) \\ &= 4(\text{integer}). \end{aligned}$$

Thus $n^2 - 1$ is divisible by 4.

**3.** Show that if $a$ and $b$ are divisible by $d$ then so is $3a + 4b$.

$a$ divisible by $d \Rightarrow a = kd$ for some $k$

$b$ divisible by $d \Rightarrow a = \ell d$ for some $\ell$

$$\begin{aligned} 3a + 4b &= 3kd + 4\ell d \\ &= (3k + 4\ell)d \\ &= (\text{integer})d \end{aligned}$$

Thus $d \mid (3a + 4b)$