Staple!

Ord: ___ ___

NT MAS4203 *4D70* | **Class-A** | Prof. JLF King Wedn., 18Jul2018

A4: *Show no work. Write* **DNE** *in a blank if the described object does not exist or if the indicated operation cannot be performed.*

a Prof. King wears bifocals, and cannot read small handwriting. Circle one: **True!** **Yes!** ***Who??***

b For prime $p = 59$, value -2 is a p-QR. *T* *F*
[*Hint:* LST or LST+RS.]

c The ***Blip-numbers*** comprise $\mathcal{B} := 1 + 3\mathbb{N}$.
$\mathcal{B}$-number $595 \overset{\text{note}}{=\!=} 35 \cdot 17$ is $\mathcal{B}$-*irreducible*: *T* *F*
Blip $N := 55$ is **not** $\mathcal{B}$-*prime* because Blips $J :=$ _____ and $K :=$ _____ satisfy that $N \bullet [J \cdot K]$, **yet** $N \nmid J$ and $N \nmid K$.
Also, $\mathcal{B}$-GCD$(175, 70) =$ _____.

d Write $27^{2009} \equiv_7$ _____ (i.e, working mod 7) and $9^{35} \equiv_7$ _____, each as a value in $[0\,..\,7)$.
[*Hint:* This can be done by inspection.]

e Suppose $x,y,N \in \mathbb{Z}_+$, with $x^2 + 2y^2 = N$ and $N \perp x$.
Statement "*Integer* $-2 \in \mathrm{QR}_N$" is: *AT* *AF* *Nei*
And stmt "*Integer* $+2 \in \mathrm{QR}_N$" is: *AT* *AF* *Nei*

f Cubic polynomial $h(x) := [x+5][x-11][x+37]$ has K many roots in $\mathbb{Z}_8$, and N many roots in $\mathbb{Z}_{120}$, where $K =$ _____ and $N =$ _____. [*Hint:* CRT.]

g With $K := 105$, ring $\mathbb{Z}_K$ has $|\mathrm{ZD}_K| =$ _____ and $|\mathrm{NQR}_K| =$ _____.

OYOP: *In grammatical English* ***sentences****, write your essay on every* ***third*** *line* (usually)*, so that I can easily write between the lines.*

A5: EFT says: *For each posint N, every integer $b \perp N$ satisfies $b^{\varphi(N)} \equiv_N 1$.*

Write a careful proof of this Euler-Fermat Thm. Recall that $\Phi(N)$ is the units group of $\mathbb{Z}_N$, and $\varphi(N) := |\Phi(N)|$.
You may use $\equiv$ for $\equiv_N$, and use $U := \Phi(N)$.

End of Class-A

A4:	___ ___ ___	130pts
A5:	___ ___	25pts
Total:	___ ___ ___	155pts

Please PRINT your name and ordinal. Ta:

Ord: _____

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor."*

Signature: _____