Numbers & Polys
MAS3300

Exam-C

Prof. JLF King
Touch: 21Feb2017

Note. This is an open brain, open (pristine) Sigmon-Notes exam. Please write solutions for **C3**,**C4**,**C5** on separate sheets of paper. Write expressions unambiguously e.g, "$1/a+b$" should be bracketed either $[1/a]+b$ or $1/[a+b]$. (Be careful with **negative** signs!)
Every "**if**" must be matched by a "**then**."

Short answer; show NO work.

C1:

a LBolt gives $G := \text{Gcd}(165, 63) =$ ⌞. . . . . ⌟. And $165S + 63T = G$, where $S =$ ⌞. . . . . ⌟ & $T =$ ⌞. . . . . ⌟ are integers.

b Note that $\text{Gcd}(15, 21, 35) = 1$. Find particular integers S, T, U so that $15S + 21T + 35U = 1$:
$S =$ ⌞. . . . . ⌟, $T =$ ⌞. . . . . ⌟, $U =$ ⌞. . . . . ⌟.
[*Hint:* $\text{Gcd}\big(\text{Gcd}(15, 21), 35\big) = 1$.]

C2: Let **AT** **AF** **Nei** mean "Always True", "Always False", and "Neither", respectively. Let q represent a general non-zero rational number and let x, y denote general irrationals. Please (circle) the best answer.

The product $x \cdot y$ is irrational.	**AT**	**AF**	**Nei**
The sum $x + y$ is irrational.	**AT**	**AF**	**Nei**
$q \cdot x$ is irrational.	**AT**	**AF**	**Nei**
$q + x$ is irrational.	**AT**	**AF**	**Nei**

Essay questions. Please write in complete sentences.

C3: Prove that $\sqrt{15}$ is irrational.
Now prove that $\sqrt{3} + \sqrt{5}$ is irrational.

C4: Consider two posints A and B. Prove directly, using WellOrd, that there is a posint D st.

$$D\mathbb{Z} \quad = \quad A\mathbb{Z} + B\mathbb{Z}\,.$$

[*Hint:* Don't forget to first show that $A\mathbb{Z} + B\mathbb{Z}$ has a non-zero element.]

C5: Prove that there are infinitely many prime numbers.

End of Exam-C

C1:	___ ___	70pts
C2:	___ ___	40pts
C3:	___ ___	80pts
C4:	___ ___	80pts
C5:	___ ___	80pts
Total:	___ ___ ___	350pts

Print name ⌞. . . . . ⌟ Ord:

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

Signature: ⌞. . . . . ⌟

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