NT&Cryp MAT4930 | **Prac-prereq-T** | Prof. JLF King *Touch*: 2Jul2018

Show no work. *NOTE*: The **inverse-fnc** of g, often written as g^{-1}, is *different* from the **reciprocal fnc** $1/g$. E.g, suppose g is invertible with $g(-2)=3$ and $g(3)=8$: Then $g^{-1}(3)=-2$, yet $[1/g](3) \stackrel{\text{def}}{=\!=} 1/g(3) = 1/8$.

Write **DNE** in a blank if the described object does not exist or if the indicated operation cannot be performed.

T1:

a Using set-builder notation, define the set of primes.

PRIMES $= \{n \in \text{WHAT} \mid \text{Conditions on } n\}$, using some of the symbols

such that, if, then, and, or, not, 0 1 2 . . .

$\forall\ \exists\ \nexists \in \mathbb{N}\ \mathbb{Z}_+\ [a\,..\,b)\ \bullet\ +\ =$

and *avoiding* "*factor(s), divides, is-a-multiple, splits, irreducible, composite, Gcd, Lcm . . .*" and similar, uh, cheats. Every quantification must specify its set!

b On $\mathbb{Z}_+$, write $x\,\$\,y$ IFF $xy<0$. So $\$$ is [*Circle*]

Transitive: *T F*. **Symm.**: *T F*. **Reflex.**: *T F*.

On $\mathbb{Z}$, say that $x\ \nabla\ y$ IFF $x-y \leqslant 1$. Then ∇ is:

Trans.: *T F*. **Symm.**: *T F*. **Reflex.**: *T F*.

(Be *careful* on both parts!)

T2:

c The **slope** of line $3[y-5]=2[x-2]$ is ____.

Point $(-4, y)$ lies on this line, where $y=$ ____.

d Line $y=[M\cdot x]+B$ owns points $(4,3)$ and $(-2,5)$. Hence $M=$ ____ and $B=$ ____.

e Line $y=Mx+B$ is orthogonal to $y=\frac{1}{3}x+2$ and owns $(2,1)$. So $M=$ ____ and $B=$ ____.

f The solutions to $3x^2=2-2x$ are $x=$ ____.

g The four solutions to $[y-2]\cdot y\cdot[y+2]=-1/y$ are $y=$ ____.

[*Hint:* Apply the Quadratic Formula to y^2.]

h $\left[\sqrt{3}^{\sqrt{2}}\right]^{\sqrt{8}}=$ ____. $\log_{64}(16)=$ ____.

i Let $y=f(x):=[2+\sqrt[5]{x}]/3$. Its inverse-function is $f^{-1}(y)=$ ____.

j Compute the sum of this geometric series: $\sum_{n=3}^{\infty}[-1]^n\cdot[3/5]^n=$ ____.

k For natural number K, the sum $\sum_{n=3}^{3+K}4^n$ equals ____.

l $\sum_{n=1}^{\infty}r^n=\frac{5}{8}$. So $r=$ ____ or **DNE**.

[*Hint:* The sum starts with n at **one**, not zero.]

T3: Math-Greek alphabet: Please write the **two** missing data of lowercase/uppercase/name. Eg:

"iota: ___ α: ___ B: ___." You fill in: ι I A *alpha* β *beta*.

Ω: ____ Ψ: ____ H: ____

σ: ____ γ: ____ λ: ____

theta ____ rho ____ delta ____ mu ____

End of Prac-prereq-T

Print name ____ Ord: ____

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

Signature: ____