Linear Algebra
MAS4105 *14G8*

Prereq-B

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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** if the object does not exist or the operation cannot be performed. NB: **DNE** $\neq \{\} \neq 0$.

B1: [a] 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 $x - y \leq 1$. Then ∇ is:
Trans.: *T F*. **Symm.**: *T F*. **Reflex.**: *T F*.
(Be *careful* on both parts!)

___ [b] Let $\mathcal{P}_\infty$ denote the family of all *infinite* subsets of $\mathbb{N}$. Define relation $\approx$ on $\mathcal{P}_\infty$ by: $A \approx B$ IFF $A \cap B$ is infinite. Stmt "*This* $\approx$ *is an equivalence-relation*" is: *T F*

___ [c] $\left[\sqrt{2}^{\sqrt{27}}\right]^{\sqrt{3}} =$ ____. $\log_8(4) =$ ____.

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

___ [e] Quadratic $15x^2 + 23x + 6 = [Ax - \alpha] \cdot [Bx - \beta]$, for numbers $A =$ ____, $\alpha =$ ____; $B =$ ____, $\beta =$ ____.

___ [f] Below, f and g are differentiable fncs with

$$\begin{array}{llll} f(2)=3, & f(3)=5, & f'(2)=19, & f'(3)=17, \\ g(2)=11, & g(3)=13, & g'(2)=\frac{1}{2}, & g'(3)=7, \\ f(5)=43, & g(5)=23, & f'(5)=41, & g'(5)=29\,. \end{array}$$

Define the composition $C := g \circ f$. Then
$C(2) =$ ____; $C'(2) =$ ____.
Please write each answer as a product of numbers; **do not** multiply out. [*Hint:* The Chain rule.]

___ [g] Let $y = f(x) := \left[7 + \sqrt[3]{2x}\right]/5$. Its inverse-function is $f^{-1}(y) =$ ____.

___ [h] Compute the sum of this geometric series: $\sum_{k=1}^{\infty} [-1]^k \cdot [1/3]^{2k} =$ ____.

___ [i] Matrix-product $\left[\begin{smallmatrix} b \\ c \end{smallmatrix}\right] \cdot \left[\begin{smallmatrix} x & y \end{smallmatrix}\right] =$ ____.

B2: 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*.

Γ: ____ Δ: ____ Υ: ____

ν: ____ ζ: ____ μ: ____

sigma ____ xi ____ omega ____ lambda ____

End of Prereq-B

B1: ___ ___ ___ 125pts

B2: ___ ___ 20pts

Total: ___ ___ ___ 145pts

Please PRINT your Student-ID number (just this once)

____

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

Signature: ____