Ord: ___ ___

Abstract Algebra
Course $MAS4301$

Prereq-A

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A1: 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 $[1/g](3) \stackrel{\text{def}}{=} 1/g(3) = 1/8$.

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

This is an **Open Brain** but **No calculator** exam.

___ ___ **a** The **slope** of line $5[y-1] = 3[x-2]$ is ________.

Point $(-8, y)$ lies on this line, where y= ________.

___ ___ **b** Line $y = Mx + B$ is orthogonal to $y = \frac{1}{3}x + 2$ and owns $(3, -1)$. So M= ________ and B= ________.

___ ___ **c** The four solutions to $[y-2] \cdot y \cdot [y+2] = -1/y$

are y = ________

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

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

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

___ ___ **f** Suppose g is a fnc with g' never zero. Let h be the inverse-fnc of g. In terms of h, g, g' and x, write a formula for $h'(x)$= ________.

[*Hint:* The Chain rule. NOTE: h is **NOT** $1/g$.]

___ ___ **g** Let $g(x) := x^3 + x$. Then $g^{-1}(-10)$= ________

and $[g^{-1}]'(-10)$= ________.

___ ___ **h** For $x > 0$, let $B(x) := x^x$. Its derivative is

$B'(x)$= ________.

[*Hint:* How is y^z, for $y > 0$, defined in terms of the exponential fnc?]

i Below, f and g are differentiable fncs with

$$f(2) = 3, \quad f(3) = 5, \quad f'(2) = 19, \quad f'(3) = 17,$$
$$g(2) = 11, \quad g(3) = 13, \quad g'(2) = \tfrac{1}{2}, \quad g'(3) = 7,$$
$$f(5) = 43, \quad g(5) = 23, \quad f'(5) = 41, \quad g'(5) = 29\,.$$

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.]

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

k $\sum_{n=1}^{\infty} r^n = 2008$. So r= ________ or **DNE**.

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

A2: 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*.

H: ________ Υ: ________ Δ: ________

σ: ________ γ: ________ ξ: ________

lambda ________ psi ________ omega ________ mu ________

End of Prereq-A

A1: ___ ___ ___ 110pts

A2: ___ ___ 20pts

Total: ___ ___ ___ 130pts

HONOR CODE: *"I have neither requested nor received help on this exam other than from my professor (or his colleague)."*
Name/Signature/Ord

________ Ord: ___ ___