Sets and Logic
MHF3202 8768

Prereq-V

Prof. JLF King
Touch: 17Nov2017

V1: ___ ___ ___ 160pts

Total: ___ ___ ___ 160pts

Please PRINT your Name

. . . . . .

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

Signature:
. . . . . .

V1: 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.

a $\left[\sqrt{5}^{\sqrt{8}}\right]^{\sqrt{2}} =$ . . . . . . $\log_{16}(8) =$ . . . . . .

b Line $y = Mx + B$ is orthogonal to $y = \frac{1}{5}x + 2$ and owns $(4, 10)$. So $M =$ . . . . . and $B =$ . . . . . .

c Quadratic $6x^2 + 29x + 35 = [Ax - \alpha] \cdot [Bx - \beta]$, for numbers $A =$ . . . . . , $\alpha =$ . . . . . ; $B =$ . . . . . , $\beta =$ . . . . . .

d 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.]

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

f Let $g(x) := x^3 + 2x - 5$. Then $g^{-1}(7) =$ . . . . . and $[g^{-1}]'(7) =$ . . . . . .

g For natural number N, the sum $\sum_{k=18}^{18+N} 4^k$ equals . . . . . .

h Marty the martian has 3 feet. In his sock drawer, he has 50 red socks, 50 blue socks and 50 green socks; 150 socks total, loose, jumbled. The minimum number of (individual) socks he need take, to guarantee a matched set of 3 socks, is . . . . . .