

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.

**U1:**

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

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

On  $\mathbb{Z}$ , say that  $x \nabla y$  IFF  $x-y \leq 1$ . Then  $\nabla$  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**  $[\sqrt{2}^{\sqrt{27}}]^{\sqrt{3}} = \dots$ .  $\log_8(4) = \dots$ .

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

**e** Below,  $f$  and  $g$  are differentiable fncs with

$$f(2) = 3, \quad f(3) = 5, \quad f'(2) = 19, \quad f'(3) = 17,$$

$$g(2) = 11, \quad g(3) = 13, \quad g'(2) = \frac{1}{2}, \quad g'(3) = 7,$$

$$f(5) = 43, \quad g(5) = 23, \quad f'(5) = 41, \quad g'(5) = 29.$$

Define the composition  $C := g \circ f$ . Then

$$C(2) = \dots; \quad C'(2) = \dots.$$

Please write each answer as a product of numbers; **do not** multiply out. [Hint: The Chain rule.]

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

**g** Compute the sum of this geometric series:

$$\sum_{k=1}^{\infty} [-1]^k \cdot [1/3]^{2k} = \dots$$

Please PRINT your Name

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

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

Signature:

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End of Prereq-U