CS 173, Spring 18 Examlet 1, Part B

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 9 10 11 12 1 2 3 4 5 6

1. (5 points) Simplify, showing your work.

   $\log_7(\log_2 32 - \log_3 81) =$

   Solution:

   Notice that $\log_2 32 = 5$ and $\log_3 81 = 4$.

   So $\log_7(\log_2 32 - \log_3 81) = \log_7(5 - 4) = \log_7 1 = 0$

2. (10 points) Check the (single) box that best characterizes each item.

   The interval (a, b) contains b. true ☐ false ☑

   For any real number x,
   if $x \geq 10$, then $x > 10$. true ☐ false ☑

   $(p \wedge q) \vee r \equiv (p \vee r) \wedge (q \vee r)$ true ☑ false ☐

   $\log_3 2 \leq \log_2 3$ true ☑ false ☐

   For any real number x, $2\lceil x \rceil \leq \lceil 2x \rceil$ true ☐ false ☑

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1. (5 points) Remembering that log takes only positive inputs, solve $\log_{10} x + \log_{10}(x-3) = 1$ for x.

   Solution: This is equivalent to $\log_{10}(x(x-3)) = 1$. So $x(x-3) = 10$ Then we have $x^2 - 3x = 10$, so $x^2 - 3x - 10 = 0$. Factoring this, we get $(x-5)(x+2) = 0$. So x is -2 or 5. But -2 is not a legal input to log, so $x = 5$.

2. (10 points) Check the (single) box that best characterizes each item.

   $\binom{n}{k}$ $\frac{n}{k}$ ☐ $\frac{n!}{k!}$ ☐ $\frac{k!}{n!}$ ☐ $\frac{n!}{k!(n-k)!}$ ☑ $\frac{n!}{k!(k-n)!}$ ☐

   If Mickey Mouse is president of the US, then $\pi = 3$. true ☑ false ☐ undefined ☐

   $\exists n \in \mathbb{R}$, such that $n^2 = 10$. true ☑ false ☐ undefined ☐

   $\log_7 5 < 1$ true ☑ false ☐

   For any integers x and y, if $x \leq y$, then $x^2 \leq y^2$. true ☐ false ☑

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1. (5 points) Simplify, showing your work.
   $\dfrac{\log_2(48) - \log_2(3)}{3} =$
   Solution: $\frac{\log_2(48)-\log_2(3)}{3} = \frac{\log_2(16\cdot 3)-\log_2(3)}{3} = \frac{\log_2(16)+\log_2 3-\log_2(3)}{3} = \frac{\log_2(16)}{3} = \frac{4}{3}$

2. (10 points) Check the (single) box that best characterizes each item.

   $1.5 \in \mathbb{Z}$ true ☐ false ☑

   $\pi < 7$ or $\frac{3}{4} > \frac{2}{3}$ true ☑ false ☐

   $p \wedge \neg q \equiv \neg(p \rightarrow q)$ true ☑ false ☐

   $0! = 1!$. true ☑ false ☐

   For any reals x and y,
   $\lfloor x + y \rfloor = \lfloor x \rfloor + \lfloor y \rfloor$. true ☐ false ☑

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1. (5 points) Suppose $\log_k x = 5$. Then $\log_k(kx^{-3}) =$
   Solution: $\log_k(kx^{-3}) = \log_k k + \log_k x^{-3} = 1 + \log_k x^{-3} = 1 + -3\log_k x = 1 + -3 \cdot 5 = -14$

2. (10 points) Check the (single) box that best characterizes each item.

$0 \in \mathbb{N}$ true [√] false [ ]

If $\pi < 7$, then $3 < 1$ true [ ] false [√] undefined [ ]

$\neg(\neg p \to \neg q) \equiv \neg p \wedge q$ true [√] false [ ]

For any real number x, $2\lfloor x \rfloor = \lfloor 2x \rfloor$ true [ ] false [√]

$\lfloor -3 \rfloor$ 3 [ ] -3 [√] 4 [ ] -4 [ ]

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1. (5 points) Simplify, showing your work.

   $\log_4 \frac{16^2}{2^{-3}} =$

   Solution: $\log_4 \frac{16^2}{2^{-3}} = \log_4 2^8 2^3 = \log_4 2^{11} = 11 \log_4 2 = \frac{11}{2}$

2. (10 points) Check the (single) box that best characterizes each item.

   Shorthand for the set of integers. $\mathbb{Z}$ [√] $\mathbb{I}$ [ ] $\mathbb{N}$ [ ] $\mathbb{W}$ [ ]

   $\sqrt{2} > 0$ or $\sqrt{2} > 3$ true [√] false [ ]

   $(p \wedge q) \vee r \equiv (p \wedge r) \vee (q \wedge r)$ true [ ] false [√]

   7 is a real number true [√] false [ ]

   For any real number x, $\lceil \lfloor x \rfloor \rceil = \lfloor x \rfloor$. true [√] false [ ]

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1. (5 points) Simplify, showing your work.

   $\log_2(\frac{\sqrt[3]{16}}{8}) =$

   Solution: $\log_2(\frac{\sqrt[3]{16}}{8}) = \log_2(\sqrt[3]{16}) - \log_2 8 = \frac{1}{3}\log_2(16) - 3 = \frac{4}{3} - 3 = -\frac{5}{3}$

2. (10 points) Check the (single) box that best characterizes each item.

$1 \in \mathbb{Z}^+$	true	√	false					
If U. Illinois is in Paris, then $\pi < 0$.	true	√	false		undefined			
$3^2 = 9$ or $4^2 = 15$	true	√	false					
For any integer x, $2\lfloor x \rfloor = \lfloor 2x \rfloor$	true	√	false					
$\lfloor -3.4 \rfloor$	-3		3.4		-4	√	undefined	