CS 173, Fall 2016
Examlet 1, Part B

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

1. (5 points) $\log_4(16^c) + \log_3(9^c) =$

   Solution: $\log_4(16^c) + \log_3(9^c) = c\log_4(16) + c\log_3(9) = c(\log_4(16) + \log_3(9)) = c(2+2) = 4c$

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

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

   Shorthand for the set of integers. $\mathbb{J}$ ☐ $\mathbb{N}$ ☐ $\mathbb{W}$ ☐ $\mathbb{Z}$ ☑

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

   $\sqrt{-1} \in \mathbb{C}$ true ☑ false ☐

   $\sqrt{2} \in \mathbb{R}$ true ☑ false ☐

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1. (5 points) $\dfrac{1}{(\frac{1}{2})^{10} + (-\frac{1}{2})^{11}} =$

   Solution: $(\frac{1}{2})^{10} + (-\frac{1}{2})^{11} = (\frac{1}{2})^{10} + (-\frac{1}{2})(\frac{1}{2})^{10} = (1 - \frac{1}{2})(\frac{1}{2})^{10} = (\frac{1}{2})(\frac{1}{2})^{10} = (\frac{1}{2})^{11}$

   So $\frac{1}{(\frac{1}{2})^{10}+(-\frac{1}{2})^{11}} = 2^{11}$

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

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

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

   $(p \vee \neg p) \rightarrow q$ true ☐ false ☐ depends on q ☑

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

   $\lfloor -3 \rfloor$ 3 ☐ -3 ☑ 4 ☐ -4 ☐

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1. (5 points) $\dfrac{\log_3(81^k)}{7k} =$

   Solution: $\dfrac{\log_3(81^k)}{7k} = \dfrac{k\log_3(81)}{7k} = \dfrac{\log_3(81)}{7} = \dfrac{4}{7}$

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

$\sqrt{2} \in \mathbb{Q}$ true ☐ false ☑

$3^{\lfloor -1.5 \rfloor} =$ -3 ☐ $\frac{1}{9}$ ☑ $\frac{1}{3\sqrt{3}}$ ☐ $\frac{1}{3}$ ☐

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

$p \to q \equiv \neg q \to \neg p$ true ☑ false ☐

For any real number x,
if $|x + 5| \leq 10$, then $|x| \leq 20$. true ☑ false ☐ undefined ☐

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1. (5 points) $\dfrac{1}{(\frac{1}{2})^4 + (-\frac{1}{2})^6} =$

   Solution: $(\frac{1}{2})^4 + (-\frac{1}{2})^6 = (\frac{1}{2})^4 + (\frac{1}{2})^6 = 4(\frac{1}{2})^6 + (\frac{1}{2})^6 = 5\frac{1}{2})^6$

   So $\dfrac{1}{(\frac{1}{2})^4 + (-\frac{1}{2})^6} = \dfrac{1}{5(\frac{1}{2})^6} = \dfrac{1}{5}2^6$

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

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

   If George Clooney is president, then $\pi = 3$. — true [√] false [ ] undefined [ ]

   For any reals x and y, $\lfloor x + y \rfloor \geq \lfloor x \rfloor + \lfloor y \rfloor$. — true [√] false [ ]

   $0 \in \mathbb{N}$ — true [√] false [ ]

   For any real number x, $\lfloor x \rfloor \leq \lceil x \rceil$. — 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.

$\exists n \in \mathbb{Z}$, such that $n^2 = 1$.			true	√	false		undefined	
For any real number x, if $x > 10$, then $x^2 > 0$.			true	√	false		undefined	
$\lfloor -3.4 \rfloor$	-3		-4	√	3.4		undefined	
$0 \in \mathbb{Z}^+$			true		false	√		
$\log_7 5 < 1$			true	√	false			

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1. (5 points) $\log_2(40) - \log_2(5) =$

   Solution: $\log_2(40) - \log_2(5) = log_2(\frac{40}{5}) = log_2 8 = 3$

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

   $3^2 = 9$ or $4^2 = 15$ true [√] false [ ]

   For any real number x,
   if $x > 10$, then $x^2 > 0$. true [√] false [ ] undefined [ ]

   If 7 is even, then 7 is a perfect square. true [√] false [ ] undefined [ ]

   $0 \in \mathbb{Z}$ true [√] false [ ]

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