CS 173, Fall 2015
Examlet 1, Part B

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

1. (5 points) $\dfrac{\log_2(48) - \log_2(3)}{3} =$

   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.

$\sqrt{2} \in \mathbb{Q}$	true	☐	false	☑			
$3^{\lfloor -1.5 \rfloor} =$	-3	☐	$\frac{1}{9}$	☑	$\frac{1}{3\sqrt{3}}$	☐	$\frac{1}{3}$ ☐
$\forall x \in \mathbb{Q}$, if $x^2 = 3$, then $x > 1000$.	true	☑	false	☐	undefined	☐	
$p \wedge q \equiv \neg(p \to \neg q)$	true	☑	false	☐			
For any real number x, $2\lfloor x \rfloor = \lfloor 2x \rfloor$	true	☐	false	☑			

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1. (5 points) Suppose $\log_k x = 8$. Then $\log_k(x\sqrt{x}) =$

   Solution: $\log_k(x\sqrt{x}) = \log_k(x^{3/2}) = \frac{3}{2}\log_k(x) = \frac{3}{2} \cdot 8 = 12$

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

$\forall x \in \mathbb{R}$, if $\pi = 3$, then $x < 20$. (π is the familiar constant.)	true [√]	false [ ]	undefined [ ]
$\neg(p \to q) \equiv p \to \neg q$	true [ ]	false [√]	
The interval (a, b) contains b.	true [ ]	false [√]	
$\lfloor -3 \rfloor$	3 [ ]	-3 [√]	4 [ ] -4 [ ]
$\sqrt{2} \in \mathbb{R}$	true [√]	false [ ]	

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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.

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

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

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

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

   $\log_5 7 < 1$ true [ ] false [√]

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

1. (5 points) Suppose $\log_k x = 10$. Then $\log_k(x^2\sqrt{x}) =$

   Solution: $\log_k(x^2\sqrt{x}) = \log_k(x^{2.5}) = 2.5 \log_k x = 2.5 \cdot 10 = 25$

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

$3^2 = 9$ or $4^2 = 15$	true	√	false			
$0 \in \mathbb{N}$	true	√	false			
7 is a rational number	true	√	false			
For all integers n, if $n^2 = 101$, then $n > 11$.	true	√	false		undefined	
$\sqrt{2} \in \mathbb{R}$	true	√	false			

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1. (5 points) $\dfrac{\log_2(32^3)}{5} =$

   Solution: $\dfrac{\log_2(32^3)}{5} = \dfrac{3\log_2(32)}{5} = \dfrac{3\log_2(2^5)}{5} = \dfrac{3 \cdot 5}{5} = 3$

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

The interval $[a, b]$ contains b.	true	√	false			
For all positive integers n, if $n! < 10$, then $n < 100$.	true	√	false		undefined	
For any real number x, $\lfloor x \rfloor < \lceil x \rceil$.	true		false	√		
7 is a real number	true	√	false			
$(p \wedge \neg p) \rightarrow q$	true	√	false		depends on q	

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1. (5 points) $\log_3(45) - \log_3(10) =$

   Solution: $\log_3(45) - \log_3(10) = \log_3(9) + \log_3(5) - \log_3(5) - \log_3(2) = \log_3(9) - \log_3(2) = 2 - \log_3(2)$

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

0!	0	☐	1	☑	-1	☐	undefined	☐

For any real number x, if $\lvert x+5\rvert \leq 10$, then $\lvert x\rvert \leq 20$.	true	☑	false	☐	undefined	☐
$\neg(p \to q) \equiv \neg p \to \neg q$	true	☐	false	☑		
$\forall x \in \mathbb{N}$, if $x < -10$, then $x = \pi$. (π is the familiar constant.)	true	☑	false	☐	undefined	☐
$\log_3 2 \leq \log_2 3$	true	☑	false	☐		