CS 173, Spring 2015
Examlet 1, Part B

NETID:

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Discussion: Monday 9 10 11 12 1 2 3 4 5

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.

   For any real number x, if $|x + 5| \leq 10$, then $|x| \leq 20$. — true [√] false [ ] undefined [ ]

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

   $\forall x \in \mathbb{R}$, if $\pi = 3$, then $x < 20$. (π is the familiar constant.) — true [√] false [ ] undefined [ ]

   $3^{\lfloor -1.5 \rfloor} =$ — -3 [ ] $\frac{1}{9}$ [√] $\frac{1}{3\sqrt{3}}$ [ ] $\frac{1}{3}$ [ ]

   7 is a rational number — 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 $n^2 = 10$.	true		false	√	undefined		
$\lfloor -3.4 \rfloor$	-3		-4	√	3.4		undefined	
$(p \vee \neg p) \rightarrow q$	true		false		depends on q	√	
$0 \in \mathbb{N}$	true	√	false				
For any real number x, $\lfloor x \rfloor < \lceil x \rceil$.	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.

$\log_5 7 < 1$	true		false	√			
$p \vee q \equiv \neg p \rightarrow q$	true	√	false				
For all positive integers n, if $n! < -10$, then $n > 8$.	true	√	false		undefined		
$\lfloor -3 \rfloor$	3		-3	√	4		-4
$\forall x \in \mathbb{R}$, if $x^2 > 100$, then $\lvert x \rvert \geq 10$.	true	√	false		undefined		

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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.

For all positive integers n, if $n! < 10$, then $n < 100$.	true [√]	false [ ]	undefined [ ]
$0 \in \mathbb{N}$	true [√]	false [ ]	
$\log_2 3 < \log_3 2$	true [ ]	false [√]	
$p \wedge q \equiv \neg(p \rightarrow \neg q)$	true [√]	false [ ]	
For any real number x, $\lceil \lfloor x \rfloor \rceil = \lfloor x \rfloor$.	true [√]	false [ ]	

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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.

0!	0	☐	1	☑	-1	☐	undefined	☐

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

$1.5 \in \mathbb{Z}$	true	☐	false	☑

For any real number x, $2\lfloor x \rfloor = \lfloor 2x \rfloor$	true	☐	false	☑

For all integers n, if $n^2 = 101$, then $n > 11$.	true	☑	false	☐	undefined	☐

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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	☑		
$(p \wedge \neg p) \rightarrow q$	true	☑	false	☐	depends on q	☐
For any rational number x, $\lfloor x \rfloor < \lceil x \rceil$	true	☐	false	☑		
$\forall x \in \mathbb{N}$, if $x < -10$, then $x = \pi$. (π is the familiar constant.)	true	☑	false	☐	undefined	☐
The interval (a, b) contains b.	true	☐	false	☑		