CS 173, Spring 19 Examlet 1, white

Name: _____

NetID: _____ **Lecture: A B**

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

1. (5 points) Multiply out and simplify, showing your work.
   $(x^{x-2} + x^2)^2 =$

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

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

   If $\sqrt{2}$ is rational, then -3 is positive. true ☐ false ☐ undefined ☐

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

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

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

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.
   $\frac{\log_2(32^3)}{5} =$

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

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

   For all positive integers n,
   if $n! < 10$, then $n < 100$. true ☐ false ☐

   $a^{b^c} = (a^b)^c$ 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 ☐

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

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

   Shorthand for the set of rationals. $\mathbb{R}$ ☐ $\mathbb{F}$ ☐ $\mathbb{Q}$ ☐ $\mathbb{B}$ ☐

   Assume x is real.
   If $x^2 < 0$, then x is even. true ☐ false ☐ undefined ☐

   7 is a rational number true ☐ false ☐

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

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

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.

   $x - \dfrac{x^2 - 2}{x - \sqrt{2}} =$

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

$-5 \in \mathbb{Z}$	true ☐	false ☐	
$\exists n \in \mathbb{Z}$, $n \geq 3$ and $n \leq 3$.	true ☐	false ☐	undefined ☐
For some real number x, $\lceil x \rceil \leq \lfloor x \rfloor$.	true ☐	false ☐	
$(p \wedge \neg p) \rightarrow q$	true ☐	false ☐	depends on q ☐
For any real numbers x and y, if $x \leq y$, then $x^2 \leq y^2$.	true ☐	false ☐	

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.

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

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

$0 \in \mathbb{Z}$ true ☐ false ☐

If $\pi < 7$, then $3 < 1$ true ☐ false ☐ undefined ☐

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

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

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

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.

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

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

$0 \in \mathbb{Z}^+$ true ☐ false ☐

For any integer x,
if x is positive, then x is a real number. true ☐ false ☐

$\log_5 7 < 1$ true ☐ false ☐

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

$\exists n \in \mathbb{Z}$, such that $n^2 = 1$. true ☐ false ☐ undefined ☐

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.
   $\log_3(45x) - \log_3(5x) =$

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

   $0 \in \mathbb{R}$ true ☐ false ☐

   If $\pi > 7$, then $3 < 1$ true ☐ false ☐ undefined ☐

   0! 0 ☐ 1 ☐ -1 ☐ undefined ☐

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

   2 is in the interval $(0, 2)$. true ☐ false ☐

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) Express $\frac{1}{2}[(2\log_2 a + \log_2 b) - 5\log_2 c]$ as a single logarithm.

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

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

For any real number x,
if $x > 10$, then $x^2 > 0$. true ☐ false ☐

For any integer x, $\lfloor x \rfloor = x$. true ☐ false ☐

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

$5 \in \mathbb{Q}$ true ☐ false ☐

CS 173, Fall 18 Examlet 1, Part B

Name: _____

NetID: _____ **Lecture: B**

Discussion: Friday 11 12 1 2 3 4

1. (5 points) Simplify, showing your work.
   $\log_3(45x) - \log_3(5x) =$

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 ☐

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

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

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

CS 173, Fall 18 Examlet 1, Part B

Name:_____

NetID:_____ **Lecture: B**

Discussion: Friday 11 12 1 2 3 4

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

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

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

If 7 is even,
then 7 is a perfect square. true ☐ false ☐ undefined ☐

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

$\log_7 5 < 1$ true ☐ false ☐

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

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 ☑

Name:_____

NetID:_____ **Lecture: A B**

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

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 ☑

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.
   $\dfrac{\log_2(48) - \log_2(3)}{3} =$
   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 ☑

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) 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 [ ]

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.

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

   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 [ ]

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.

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

   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	

CS 173, Fall 17 Examlet 1, Part B

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) Simplify, showing your work.
   $2^{\log_4 n} =$

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

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

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

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

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

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

CS 173, Fall 17 Examlet 1, Part B

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) Multiply out and simplify, showing your work.
   $(x^{x-2} + x^2)^2 =$

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

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

   $\exists n \in \mathbb{Z}$, $n \geq 3$ and $n \leq 3$. true ☐ false ☐ undefined ☐

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

   $\lfloor -3.4 \rfloor + \lceil -3.4 \rceil$ -6 ☐ -6.8 ☐ -7 ☐ -8 ☐

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

Name:_____

NetID:_____ **Lecture: A B**

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

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

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

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

$6 \in \mathbb{C}$ true ☐ false ☐

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

For any real number x, $\lfloor x \rfloor \leq \lceil x \rceil$. true ☐ false ☐

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

If U. Illinois is in Paris,
then $\pi < 0$. true ☐ false ☐ undefined ☐

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) Simplify, showing your work.
   $(\log_2 17)(\log_{17} 64) =$

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 ☐

   7 is a rational number true ☐ false ☐

   For some real number x,
   $\lceil x \rceil \leq \lfloor x \rfloor$. true ☐ false ☐

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

   For any real numbers x and y,
   if $x \leq 6$ and $y \leq 2$, then $x - y \leq 4$. true ☐ false ☐

CS 173, Fall 17 Examlet 1, Part B

Name:_____

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

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

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

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

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

For any integer x,
if x is positive, then x is a real number. true ☐ false ☐

For any real numbers x and y,
if $xy \leq 17y$, then $x \leq 17$. true ☐ false ☐

Shorthand for the set of rationals. $\mathbb{R}$ ☐ $\mathbb{F}$ ☐ $\mathbb{Q}$ ☐ $\mathbb{B}$ ☐

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

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) Simplify, showing your work.
$\frac{(2^3 \times 2^5)^{10}}{512} =$

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

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

If $\pi > 7$, then $3 < 1$ true ☐ false ☐ undefined ☐

$\lfloor -3.4 \rfloor$ -3 ☐ -4 ☐ 3.4 ☐ undefined ☐

The interval $[a, b]$ contains b. true ☐ false ☐

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

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) $\dfrac{\log_3(81^n)}{\log_3 \frac{1}{27}} =$

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 ☐

2 is in the interval $(0, 2)$. true ☐ false ☐

$\log_5 7 < 1$ true ☐ false ☐

If $\sqrt{2}$ is rational, then -3 is positive. true ☐ false ☐ undefined ☐

$\log_7 1$ 0 ☐ 1 ☐ 7 ☐ undefined ☐

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) $4^{\log_2(7n)} =$

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

$\frac{3}{7}$ is a real number	true ☐	false ☐
$p \to q \equiv \neg p \to \neg q$	true ☐	false ☐
$p \vee q \equiv \neg p \to q$	true ☐	false ☐
For any integer x, $\lfloor x \rfloor = x$.	true ☐	false ☐
$\forall x \in \mathbb{R}$, if $x^2 > 100$, then $\lvert x \rvert \geq 10$.	true ☐	false ☐

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) $x - \dfrac{x^2 - 2}{x - \sqrt{2}} =$

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

$-5 \in \mathbb{N}$ true ☐ false ☐

0! 0 ☐ 1 ☐ -1 ☐ undefined ☐

$a^{b^c} = (a^b)^c$ true ☐ false ☐

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

For any real number x,
if $x \in \mathbb{N}$, then $x \in \mathbb{Q}$. true ☐ false ☐

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) $25 \times 2^{-3\log_2(5)} =$

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

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

For all positive integers n,
if $n! < 10$, then $n < 100$. true ☐ false ☐

$\lfloor -3.4 \rfloor$ -3 ☐ 3.4 ☐ -4 ☐ undefined ☐

$0 \in \mathbb{N}$ true ☐ false ☐

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

Name:_____

NetID:_____ **Lecture: A B**

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

1. (5 points) Express $\frac{1}{2}[(2\log_2 a + \log_2 b) - 5\log_2 c]$ as a single logarithm.

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

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

For any real number x,
if $x > 10$, then $x^2 > 0$. true ☐ false ☐

For any integer x, $\lfloor x \rfloor = x$. true ☐ false ☐

$0 \in \mathbb{Z}^+$ true ☐ false ☐

7 is a real number true ☐ false ☐

Name:_____

NetID:_____ **Lecture: A B**

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

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

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 ☐
$\pi < 7$ or $\frac{3}{4} > \frac{2}{3}$	true ☐	false ☐	
If 7 is even, then 7 is a perfect square.	true ☐	false ☐	undefined ☐
$-5 \in \mathbb{Z}$	true ☐	false ☐	
For any real number x, $2\lfloor x \rfloor = \lfloor 2x \rfloor$	true ☐	false ☐	