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.
   $(x^{x-2} + x^2)^2 =$

   Solution:
   $(x^{x-2} + x^2)^2 = (x^{x-2})^2 + 2x^{x-2}x^2 + (x^2)^2 = x^{2x-4} + 2x^x + x^4$

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 ☑

   $(p \vee \neg p) \to q$ 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.

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

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

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

   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.

   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.

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

   Solution: $x^2 - 2 = (x - \sqrt{2})(x + \sqrt{2})$

   So $\frac{x^2-2}{x-\sqrt{2}} = (x + \sqrt{2})$

   So $x - \frac{x^2-2}{x-\sqrt{2}} = x - (x + \sqrt{2}) = -\sqrt{2})$

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.

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

   Solution: $\frac{1}{(\frac{1}{2})^4 + (-\frac{1}{2})^5} = \frac{1}{\frac{1}{16} - \frac{1}{32}} = \frac{1}{\frac{2-1}{32}} = \frac{1}{\frac{1}{32}} = 32$

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.

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

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

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.
   $\log_3(45x) - \log_3(5x) =$
   Solution: $\log_3(45x) - \log_3(5x) = \log_3 \frac{45x}{5x} = \log_3 9 = 2$

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.

   Solution: $\frac{1}{2}[(2\log_2 a + \log_2 b) - 5\log_2 c] = \frac{1}{2}[\log_2(a^2 b) - 5\log_2 c] = \frac{1}{2}(\log_2(\frac{a^2 b}{c^5})) = \log_2(\sqrt{\frac{a^2 b}{c^5}})$

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.

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

   Solution: $\log_3(45x) - \log_3(5x) = \log_3 \frac{45x}{5x} = \log_3 9 = 2$

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 $\log_k(x\sqrt{x}) =$
   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.

   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:_____

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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:_____

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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 ☑

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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:_____

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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:_____

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

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

   Solution: $2^{\log_4 n} = (4^{1/2})^{\log_4 n} = (4^{\log_4 n})^{1/2}) = n^{1/2}$

   Also ok to use the change of base formula and/or express the result as $\sqrt{n}$.

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:_____

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

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

   Solution:
   $(x^{x-2} + x^2)^2 = (x^{x-2})^2 + 2x^{x-2}x^2 + (x^2)^2 = x^{2x-4} + 2x^x + x^4$

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.

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

   Solution: $\frac{1}{(\frac{1}{2})^4 + (-\frac{1}{2})^5} = \frac{1}{\frac{1}{16} - \frac{1}{32}} = \frac{1}{\frac{2-1}{32}} = \frac{1}{\frac{1}{32}} = 32$

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.
   $(\log_2 17)(\log_{17} 64) =$
   Solution: $(\log_2 17)(\log_{17} 64) = \log_2 64 = 6$
   If you don't understand the first step, look up the change of base formula.

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:_____

NetID:_____ **Lecture: A B**

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

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

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

   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.

   $p \wedge q \equiv \neg(p \rightarrow \neg q)$ 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.
   $\frac{(2^3 \times 2^5)^{10}}{512} =$
   Solution: $\frac{(2^3 \times 2^5)^{10}}{512} = \frac{(2^{3+5})^{10}}{2^9} = \frac{2^{80}}{2^9} = 2^{71}$

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:_____

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

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

   Solution: $\frac{\log_3(81^n)}{\log_{\frac{1}{27}}} = \frac{n\log_3(81)}{-\log_3 27} = \frac{4n}{-3} = -\frac{4}{3}n$

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:_____

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

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

   Solution: Notice that $(a^b)^c = a^{bc} = (a^c)^b$. So we have
   $4^{\log_2(7n)} = (2^2)^{\log_2(7n)} = (2^{\log_2(7n)})^2 = (7n)^2 = 49n^2$

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

   Solution: $x^2 - 2 = (x-\sqrt{2})(x+\sqrt{2})$

   So $\frac{x^2-2}{x-\sqrt{2}} = (x+\sqrt{2})$

   So $x - \frac{x^2-2}{x-\sqrt{2}} = x - (x+\sqrt{2}) = -\sqrt{2})$

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

   $-5 \in \mathbb{N}$ true ☐ false ☑

   0! 0 ☐ 1 ☑ -1 ☐ undefined ☐

   $a^{bc} = (a^b)^c$ 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) $25 \times 2^{-3\log_2(5)} =$

   Solution: $25 \times 2^{-3\log_2(5)} = 25 \times (2^{\log_2(5)})^{-3} = 25 \times 5^{-3} = 25 \times \frac{1}{125} = \frac{1}{5}$

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.

   Solution: $\frac{1}{2}[(2\log_2 a + \log_2 b) - 5\log_2 c] = \frac{1}{2}[\log_2(a^2 b) - 5\log_2 c] = \frac{1}{2}(\log_2(\frac{a^2 b}{c^5})) = \log_2(\sqrt{\frac{a^2 b}{c^5}})$

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

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

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 ☑