Name:_____

NetID:_____ **Lecture: A B**

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

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

   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 [ ]

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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 [ ]

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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 ☐

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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	☐	$\frac{1}{9}$	☑	$\frac{1}{3\sqrt{3}}$	☐	$\frac{1}{3}$	☐

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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 ☐

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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 ☑