

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 $\log_3 81 = 4$.

$$\text{So } \log_7(\log_2 32 - \log_3 81) = \log_7(5 - 4) = \log_7 1 = 0$$

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

☒

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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.

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

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

$$\frac{\log_2(48) - \log_2(3)}{3} =$$

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 ☒

$$\pi < 7 \text{ or } \frac{3}{4} > \frac{2}{3}$$

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 ☒

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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.

$0 \in \mathbb{N}$

true

☒

false

☐

If $\pi < 7$, then $3 < 1$

true

☐

false

☒

undefined

☐

$\neg(\neg p \rightarrow \neg q) \equiv \neg p \wedge q$

true

☒

false

☐

For any real number x , $2\lfloor x \rfloor = \lfloor 2x \rfloor$

true

☐

false

☒

$\lfloor -3 \rfloor$

3

☐

-3

☒

4

☐

-4

☐

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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 ☐

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

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

Solution: $\log_2\left(\frac{\sqrt[3]{16}}{8}\right) = \log_2(\sqrt[3]{16}) - \log_2 8 = \frac{1}{3} \log_2(16) - 3 = \frac{4}{3} - 3 = -\frac{5}{3}$

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

☐

$3^2 = 9 \text{ or } 4^2 = 15$

true

☒

false

☐

For any integer x ,
 $2\lfloor x \rfloor = \lfloor 2x \rfloor$

true

☒

false

☐

$\lfloor -3.4 \rfloor$

-3

☐

3.4

☐

-4

☒

undefined

☐