

CS 173, Spring 2016

Examlet 1, Part B

NETID:

FIRST:

LAST:

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

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.

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

true

☐

false

☒

Shorthand for the set of integers.

$\mathbb{Z}$

☒

$\mathbb{I}$

☐

$\mathbb{N}$

☐

$\mathbb{W}$

☐

$$\log_7 5 < 1$$

true

☒

false

☐

$$6 \in \mathbb{C}$$

true

☒

false

☐

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

true

☐

false

☒

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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.

$\sqrt{2}$ is in the interval $(0, 2)$.

true

☒

false

☐

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

true

☒

false

☐

undefined

☐

If $\sqrt{2}$ is rational, then -3 is positive.

true

☒

false

☐

undefined

☐

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

true

☒

false

☐

$\sqrt{2} \in \mathbb{R}$

true

☒

false

☐

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1. (5 points) Solve $-15 = -8 \log_2(2x) + 7$ for x .

Solution: $-15 = -8 \log_2(2x) + 7$ implies that $-22 = -8 \log_2(2x)$, so $\frac{11}{4} = \log_2(2x) = \log_2 x + 1$.
So $\frac{7}{4} = \log_2(x)$. And therefore $x = 2^{\frac{7}{4}}$.

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

$0 \in \mathbb{Z}$

true

☒

false

☐

$\lfloor -3.4 \rfloor$

-3

☐

3.4

☐

-4

☒

undefined

☐

For any real number x ,
 $\lceil \lfloor x \rfloor \rceil = \lfloor x \rfloor$.

true

☒

false

☐

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

true

☒

false

☐

undefined

☐

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

true

☒

false

☐

undefined

☐

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1. (5 points) $\log_4 \frac{16^2}{2^{-3}} =$

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.

$p \rightarrow q \equiv q \rightarrow p$

true

☐

false

☒

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

true

☒

false

☐

undefined

☐

$\sqrt{2} \in \mathbb{R}$

true

☒

false

☐

$0 \in \mathbb{R}$

true

☒

false

☐

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

true

☒

false

☐

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1. (5 points) $\log_2\left(\frac{\sqrt[3]{16}}{8}\right) =$

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.

$p \rightarrow q \equiv \neg p \rightarrow \neg q$

true

☐

false

☒

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

true

☒

false

☐

undefined

☐

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

true

☒

false

☐

$5 \in \mathbb{Q}$

true

☒

false

☐

7 is a real number

true

☒

false

☐