MATH 100 SOLUTIONS: QUIZ IV 4 OCTOBER 2018

(basic calculator permitted)

To obtain any credit, you must show your work for each problem! Place a box around each answer.

1. *[2 pts each]* Solve the inequalities. *Express your answer in interval form.*
If there is no solution, write "No Solution."

(a) $\frac{x-4}{3} > -11$

Solution: Multiply both sides by 3:

$x - 4 > -33$

So $x > -29$.

In interval notation, one would write $(-20, \infty)$.

(b) $-2 \geq 1 - 2x > 4$

Answer: No solution, since $-2 > 4$ is impossible.

(c) $19 \geq 3x + 1 > 7$

Solution: Split this into two inequalities.

$19 \geq 3x + 1$ AND $3x + 1 > 7$

Using the first inequality: $18 \geq 3x$, $6 \geq x$, $x \leq 6$

Solving the second inequality: $3x + 1 > 7$

$3x > 6$

$x > 2$

*Hence **$2 < x \leq 6$**. In interval form: **$(2, 6]$***

(d) $|2x + 1| < 7$

Solution: Removing the absolute value:

$$-7 < 2x + 1 < 7$$

We separate this into two inequalities:

$$-7 < 2x + 1 \ \textbf{and} \ 2x + 1 < 7$$

First inequality $-7 < 2x + 1 \Rightarrow -8 < 2x \Rightarrow -4 < x$

Second inequality $2x + 1 < 7 \Rightarrow 2x < 6 \Rightarrow x < 3$

*Thus **$-4 < x < 3$**. In interval form: **$(-4, 3)$**.*

2. *[2 pts each]* Solve for *x* in each of the following equations:

(a) $|3x - 1| = 8$

Solution: $3x - 1 = \pm 8$

So $3x = 1 \pm 8$. *In other words,* $3x = 9$ *or* $3x = -7$.

Hence $\mathbf{x = 3, x = -7/3}$ *are the solutions.*

(b) $|x + 8| = -1$

Answer: No solution, since the absolute value of a number can never be negative.

(c) $|5x - 10| = 0$

Solution: $5x - 10 = 0$; *So* $x = 2$ *is the only solution.*

(d) $|3x - 5| = |4 - 5x|$

Solution: Removing the absolute values, we have two equalities to solve:

First equality: $3x - 5 = 4 - 5x$

Second equality: $3x - 5 = -(4 - 5x)$

Solving the first equality: $3x - 5 = 4 - 5x \implies 3x = 9 - 5x \implies 8x = 9 \implies x = \frac{9}{8}$

Solving the second equality:

$$3x - 5 = -(4 - 5x) \implies 3x - 5 = -4 + 5x \implies 3x = 1 + 5x \implies -2x = 1 \implies x = -\frac{1}{2}$$

Thus the solutions are $x = -\mathbf{\frac{1}{2}}$ *and* $\boldsymbol{x = \frac{9}{8}}$

3. *[2 pts each]* (a) Multiple choice: A union meeting will be held at 3:00 pm and the doors will be open only from 2:50 pm to 3:10 pm. Which of the following inequalities can be used to assess if an employee will be allowed to enter given that *t* is the time in hours after noon when she arrives?

- **$|t - 3| \leq 1/6$**
- $|t - 1/6| \geq 3$
- $|t - 3| \leq 10$
- $|t - 10| \geq 3$

Solution: The correct answer is the first: If an employee must arrive within 10 min (or 1/6 hour) of t = 3 (which is 3:00 pm) she must enter between t = 3 – 1/6 hours (which is 2:50 pm) and t = 3 + 1/6 hours (which is 3:10 pm).

(b) The street built in the city must be 25 feet in width with a tolerance of 0.5 feet. Streets that are not within the tolerated widths must be repaired. Which of the following inequalities can be used to assess which streets are within tolerance? (W is the width of the street) .

- $|W - 0.5| \geq 25$
- $|W - 0.5| \leq 25$
- $|W - 25| \geq 0.5$
- **$|W - 25| \leq 0.5$**

Solution: The correct solution is the fourth (or last). The tolerance is 0.5 ft. So the street width must lie between 25 – ½ feet and 25 + ½ feet.
