§2.8 #63   Question

No video, today, but here's a writeup

$f(x) = -4|3x-1|$ and $g(x) = -16$. Solve:

(a) $f(x) = g(x)$,   (b) $f(x) > g(x)$ (c) $f(x) \leq g(x)$

Equivalent statements:

$f(x) - g(x) = 0$, $f(x) - g(x) > 0$, $f(x) - g(x) \leq 0$

(a) $f(x) = -4|3x-1| \overset{SET}{=} -16 = g(x)$

$$-4|3x-1| = -16$$

$$|3x-1| = \frac{-16}{-4} = 4$$

$3x-1 = 4$ OR $3x-1 = -4$

$3x = 5$ OR $3x = -3$

$x = \frac{5}{3}$ OR $x = -1$

$\{x | x = \frac{5}{3}$ OR $x = -1\}$

"Solution Set" My Lab wants is simply

$$\left\{-1, \frac{5}{3}\right\}$$

(b) $f(x) > g(x)$

$-4|3x-1| > -16$

$|3x-1| < \frac{-16}{-4} = 4$

$3x-1 < 4$ AND $3x-1 > -4$

$3x < 5$ $\qquad\qquad$ $3x > -3$

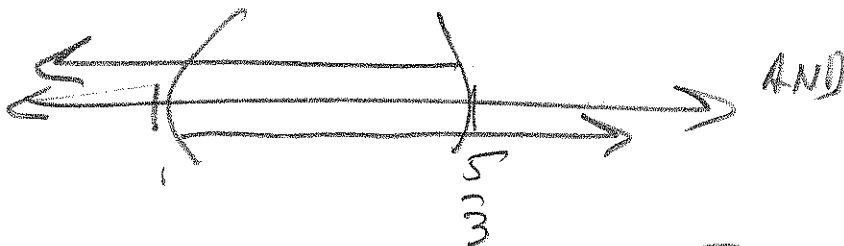$x < \frac{5}{3}$ $\qquad$ AND $\qquad$ $x > 1$

$= \left\{ x \mid x < \frac{5}{3} \text{ and } x > 1 \right\}$

$= \left(1, \frac{5}{3} \right)$

$|A| < B \Longrightarrow$

$A < B$ AND $A > -B$

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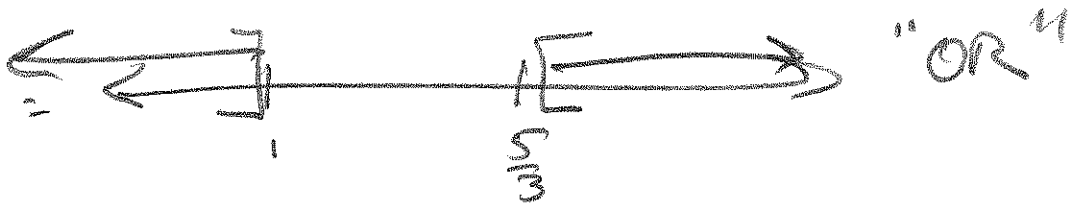(c) $f(x) \le g(x)$ $|A| \ge B$

$-4|3x-1| \le -16$ $A \ge B$ OR $A \le -B$

$|3x-1| \ge \dfrac{-16}{-4} = 4$ Divide by -4 ⟶
                            switch/reverse the
                            inequality!

$3x-1 \ge 4$ OR $3x-1 \le -4$

$3x \ge 5$ OR $3x \le -3$

$\{x \mid x \ge \frac{5}{3}$ OR $x \le 1\} = $ Sol'n set

"OR"

1        $\frac{5}{3}$

$= (-\infty, 1] \cup [\frac{5}{3}, \infty)$