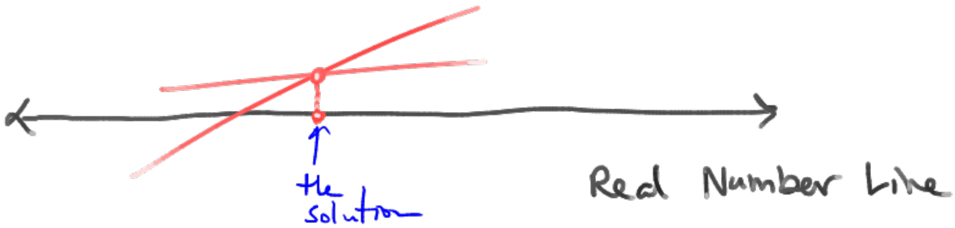
$5x+1 = 2x+7$

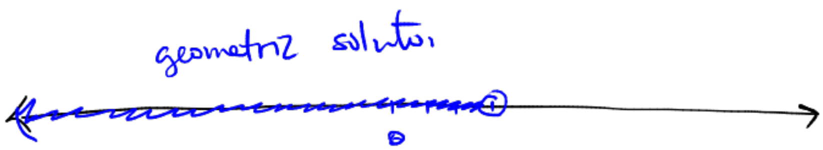


Ex. $x < 3$
set notation

negative infinity

$(-\infty, 3)$
interval notation

geometric solution



Ex. $2x+1 < 5$

$\quad -1 \quad -1$

$2x < 4$

$x < 2$

$(-\infty, 2)$

Ex. $1-2x < 5$

$\quad -1 \quad\quad -1$

$-2x < 4$

$\overline{-2} \quad \overline{-2}$

$x > -2$

$(-2, \infty)$

when you divide by a negative switch the inequality sign

Ex. $2x+1 < x-3$

$\quad -x \quad\quad -x$

$x+1 < -3$

$x < -4$

$(-\infty, -4)$

$2x+1 < x-3$

$-2x \quad\quad -2x$

$1 < -x-3$

$+3 \quad\quad +3$

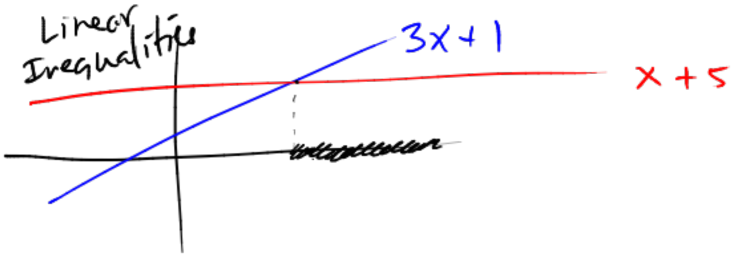
$4 < -x$

$\overline{-1} \quad \overline{-1}$

$-4 > x$

same

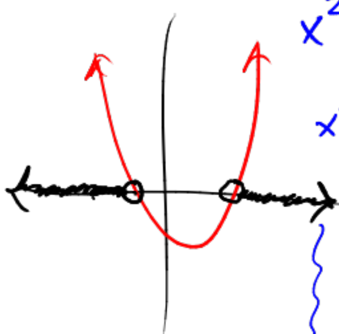
$x < -4$



The solution to:

$3x + 1 > x + 5$

Ex. Non-Linear Inequal: Any quadratic $(ax^2 + bx + c = 0)$:



$x^2 + 2x > 0$

$x^2 + 2x = 0$

$x(x+2) = 0$

$x = 0$

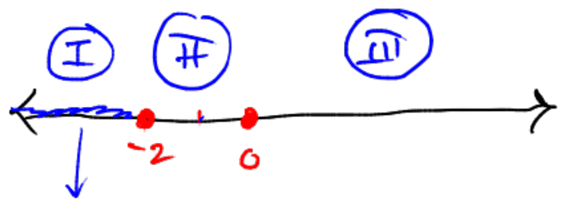
$x = -2$

critical points

To Solve:

1. set LHS = 0 to Find the "critical points"

2. Use a number line & our critical points to test & check.



pick a number in region I

$x = -3$ is plugged in:

$x^2 + 2x > 0$

$(-3)^2 + 2(-3) = 9 - 6 > 0$

TRUE ⇒ Region I is in the solution.

Repeat for region II

pick $x = -1$

$x^2 + 2x > 0$

$(-1)^2 + 2(-1) = 1 - 2 = -1 > 0$

FALSE ⇒ Region II not in solution

III $x = 1$, $x^2 + 2x > 0$

$1 + 2 > 0$ TRUE

Region III is in.

collect all solutions

$$\boxed{(-\infty, -2) \cup (0, \infty)}$$

union

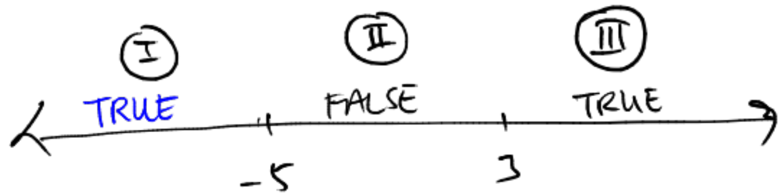
Ex. • $x^2 + 2x - 15 > 0$ solve the inequality.

1st we factor

• $(x+5)(x-3) > 0$ — need 0 on RHS for this!

now find critical points: $x+5=0 \quad x=-5$

$x-3=0 \quad x=3$



I $x = -6$ plug into factored form: $(x+5)(x-3) > 0$

$(-1)(-9) > 0$

TRUE.

II $x = 0 \Rightarrow (0+5)(0-3) > 0$ FALSE.

factored form

III $x = 4$. $(4+5)(4-3) > 0$ TRUE

$(+)(+) > 0$

$(-\infty, -5) \cup (3, \infty)$

$$\frac{1-x}{1+x} \le 0$$

1. set both numerator $= 0$ & $\underbrace{\text{denominator}}_{\text{this will not be part of sol'n}} = 0$

but it IS a critical point.

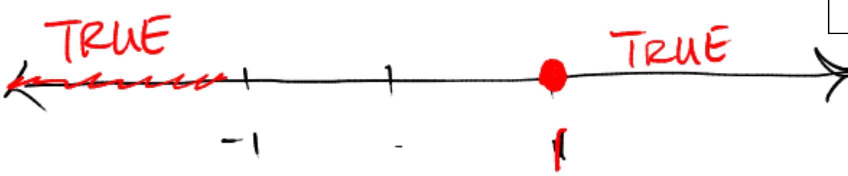
$1 - x = 0 \quad x = 1$

$1 + x = 0 \quad x = -1$

CRIT. PTS.

$\boxed{\text{sol'n: } (-\infty, -1) \cup [1, \infty)}$

I II III



I $x = -2 \Rightarrow \dfrac{1-(-2)}{1+(-2)} \le 0 \qquad \dfrac{1+2}{-1} = -3 < 0$

II $x = 0 \quad \dfrac{1-0}{1+0} = 1 \le 0 \qquad$ FALSE

III $x = 2 \Rightarrow \dfrac{1-2}{1+2} = \dfrac{-1}{3} < 0 \qquad$ TRUE

NOW PLUG IN CRITICAL PTS

$x = 1 \Rightarrow \dfrac{1-1}{1+1} \le \dfrac{0}{2} \le 0 \qquad$ TRUE

$x = -1 \quad \dfrac{1-(-1)}{1-1} = \dfrac{2}{0}$ DNE. $\qquad$ FALSE

$$x^2 \geq -5x + 50$$

CRITICAL POINTS: $x = -10$, $x = 5$

$$x^2 + 5x - 50 \geq 0 \implies (x+10)(x-5) \geq 0$$

I II III

I $x = -11 \implies \underbrace{(-11+10)}_{-1}\underbrace{(-11-5)}_{-16} \geq 0$ TRUE

II $x = 0 \implies 0^2 + 5 \cdot 0 - 50 \geq 0$ FALSE

III $x = 6 \implies (6+10)(6-5) \geq 0$ TRUE

$x = -10 \implies$ TRUE
$x = 5 \implies$ TRUE

$$\boxed{(-\infty, -10] \cup [5, \infty)}$$

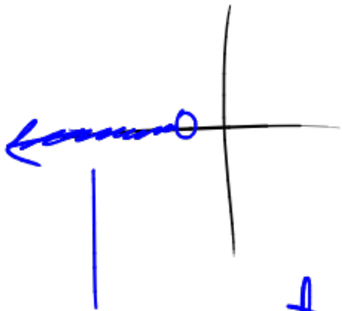
Inequalities

Inequalities (1.6)

$\boxed{3x + 1 < x - 2}$ (linear)

line   line

when is this line $y = x - 2$ above $y = 3x + 1$?



solution set

$$2x + 1 < -2$$
$$\quad -1 \qquad -1$$

$$2x < -3$$
$$\frac{2x}{2} < \frac{-3}{2}$$

$$\boxed{x < -\frac{3}{2}}$$ set notation

$$\left(-\infty, -\frac{3}{2}\right)$$
interval notation

Ex. $-3x + 1 < 5$

Solve:
$$\quad -1 \quad -1$$

$$-3x < 4$$

$$\boxed{x > \frac{4}{-3}}$$

$$-3x + 1 < 5$$
$$+3x \qquad +3x$$

$$1 < 5 + 3x$$
$$-5 \quad -5$$

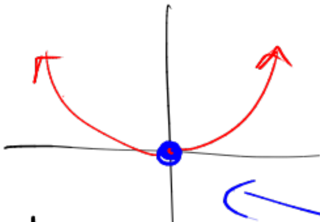
$$-4 < 3x$$
$$\frac{-4}{3} < \frac{3x}{3}$$

$$\boxed{\frac{-4}{3} < x}$$

$y = x^2$

solve

$x^2 > 0$



set RHS = 0

$x^2 = 0 \Rightarrow x = 0$

in order to find the "critical points"

"critical points"

$y = x^2 - 9$

$x^2 - 9 > 0$

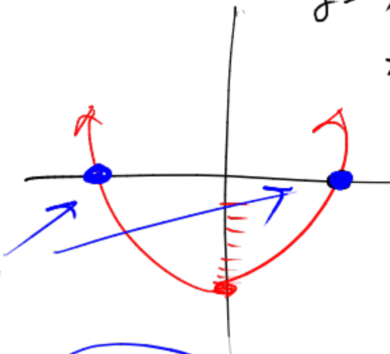
↓

set LHS $= x^2 - 9 = 0$

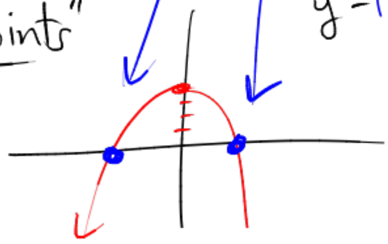
$(x-3)(x+3)$

$x = 3$

$x = -3$



$y = -x^2 + 4 = 0$



Ex. $x^2 + 2x > 0$

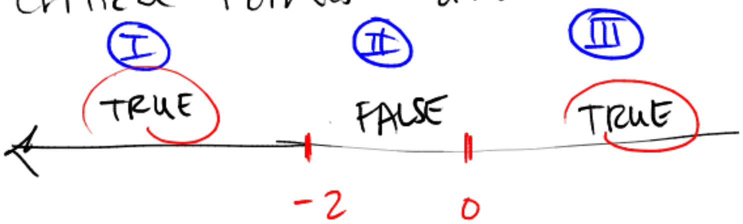
① Get 0 on RHS ✓

② Set LHS = 0 to find critical points

$x^2 + 2x = 0$

$x(x+2) = 0 \Rightarrow x = 0, \; x = -2$

③ Critical Points drawn on number line



$\boxed{(-\infty, -2) \cup (0, \infty)}$

union

④ You test each region: $x = -5$

I

$x^2 + 2x > 0$

$(-5)^2 + 2(-5) > 0$

$25 - 10 > 0$ TRUE

II

$x = -1$

$(-1)^2 + 2(-1)$

$1 - 2 > 0$

FALSE

III $x = 1 \Rightarrow 1^2 + 2(1) > 0$ TRUE

$\{x < -2\}$ or $\{x > 0\}$

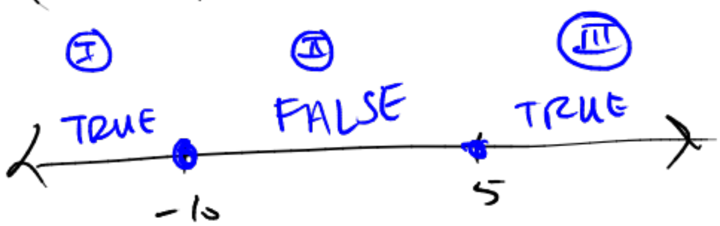
Ex. $x^2 \geq -5x + 50$ Get 0 on RHS

$x^2 + 5x - 50 \geq 0$ Solve $x^2 + 5x - 50 = 0$

$(x+10)(x-5) \geq 0$ $(x+10)(x-5) = 0$

$x = 5$

$x = -10$



$(-\infty, -10] \cup [5, \infty)$

5 is in the set

I $x = -11 \Rightarrow (-11+10)(-11-5) > 0$

$(-1)(-16) = 16 > 0$

II $x = 0 \Rightarrow 0^2 + 5 \cdot 0 - 50 > 0$ FALSE

III $x = 6 \Rightarrow (6+10)(6-5) > 0$ TRUE

Test critical points when $\leq$ or $\geq$.

$x^2 - 4x - 32 \geq 0$ Solve.

$(x-8)(x+4) = 0 \Rightarrow x = 8,\ x = -4$

I: $x = -5$, $(-13)(-1) \geq 0$ TRUE

II: $x = 0$, $-32 \geq 0$ FALSE

III: $x = 10$, $2 \cdot 6 \geq 0$ TRUE

-4, 8

$x = -4$ & $x = 8$ TRUE

$$\boxed{(-\infty, -4] \cup [8, \infty)}$$

Ex

$$\frac{1-x}{1+x} \leq 0$$

set Num $= 0 = 1 - x \Rightarrow x = 1$

Den $= 0 = 1 + x \Rightarrow x = -1$

$$(-\infty, -1) \cup [1, \infty)$$

TRUE, -1, 1, TRUE

$x = -2$: $\frac{1-(-2)}{1-2} = \frac{3}{-1} < 0$

$x = 0 = 1 \leq 0$ FALSE

$x = 2 \Rightarrow \frac{1-2}{1+2} \leq 0$ TRUE

$x = 1 \Rightarrow \frac{1-1}{1+1} = \frac{0}{2} = 0$

$x = -1$ $\frac{1-(-1)}{1-1} = \frac{2}{0}$ DNE

FALSE

$$* \ \frac{1-x}{1+x} \leq x$$

0 on RHS

1st

$$\frac{1-x}{1+x} - x \leq 0$$

$$\frac{1-x}{1+x} \ \frac{x(1+x)}{1+x} \leq 0$$

$$\frac{1 - x + x + x^2}{1+x} \leq 0$$

$$* \ \frac{1+x^2}{1+x} \leq 0$$

set $1 + x^2 = 0$

$x^2 = -1$

$x = \sqrt{-1}$

not real

$1 + x = 0$

$x = -1$

I: TRUE, II: FALSE

-2, -1, 0

$$\boxed{(-\infty, -1)}$$

$x = -2$

$\frac{1+4}{1-2} = \frac{5}{-1} \leq 0$

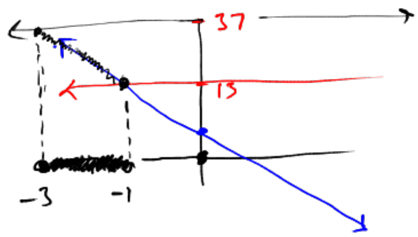
$\frac{1+0^2}{1+0} = 1 \leq 0$ FALSE

$x = -1$

$\frac{1+1}{1-1} = \frac{2}{0}$ DNE

OTHER INEQUALITIES & ABSOLUTE VALUE (1.6 & 1.7)

Ex. $\underbrace{13}_{\text{horiz}} \le \underbrace{-12x+1}_{\text{line}} \le \underbrace{37}_{\text{horiz}}$ (−3)



when is the height of the line b/w 13 & 37

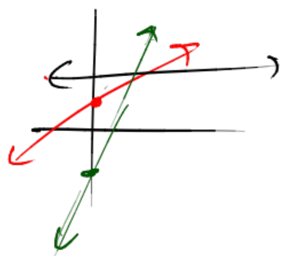
$12 \le -12x \le 36$

$-12 \quad\quad -12 \quad\quad -12$

$\Longrightarrow$ $\boxed{-1 \ge x \ge -3}$

Ex. $3x+1 \le 2x+7 \le 5x-4$ get x's in the middle

$-1 \quad\quad -1 \quad\quad -1$



$3x \le 2x+6 \le 5x-5$

$-3x \quad\quad -3x \quad\quad -3x$

$0 \le -x+6 \le 2x-5$

$-6 \quad\quad -6 \quad\quad -6$

$\underbrace{-6 \le -x} \le 2x-11$

Break into two pieces

$-6 \le -x$

$-1 \quad\quad -1$

$6 \ge x$

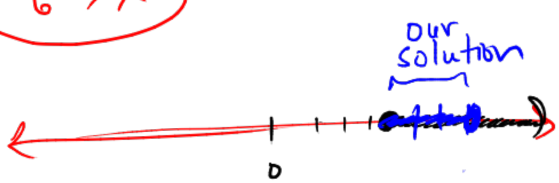
$-x \le 2x-11$

$-2x \quad\quad -2x$

$-3x \le -11$

$-3 \quad\quad -3$

$x \ge 11/3$



$\boxed{6 \ge x \ge \frac{11}{3}}$

put back together

Ex.

$7x - 1 \le 3x + 2 \le x + 5$

x=1 outside intersect.

$7(1) - 1 \le 3(1) + 2 \le 1 + 5$

$6 \le 5 \le 6$

False

$7x - 1 \le 3x + 2$

$-3x \qquad -3x$

$4x - 1 \le 2$

$4x \le 3$

$x \le \frac{3}{4}$

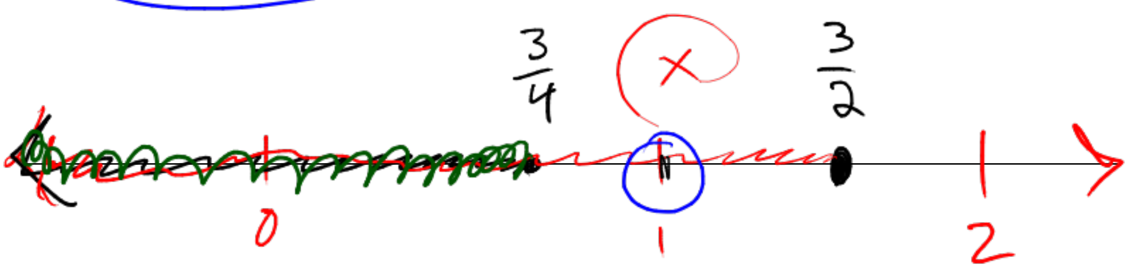
$3x + 2 \le x + 5$

$-x \qquad -x$

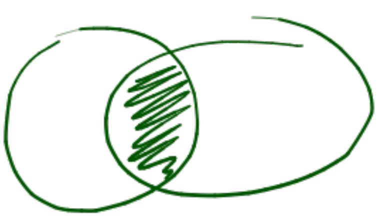
$2x + 2 \le 5$

$2x \le 3$

$x \le \frac{3}{2}$



intersect the solutions (find what's common to both)



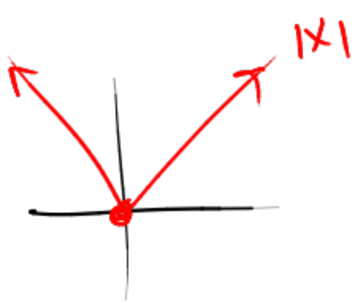
Absolute Value.

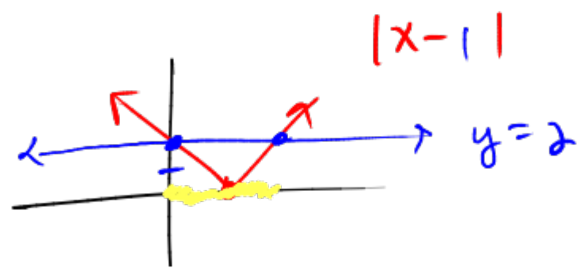
$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

$5>0$

$|5| = 5$

$|-7| = -(-7) = 7$





Ex. Solve $|x-1| = 2$

$x-1 = 2$

or $\Rightarrow$ $\boxed{\begin{aligned} x &= 3 \\ x &= -1 \end{aligned}}$

$x-1 = -2$
$+1 \quad\quad +1$

Ex. Solve $\boxed{|x-1| < 2}$ ← 1st step

$x-1 < 2$

$-2 < x-1$

or

$-2 < x-1 < 2$
$+1 \quad\quad +1 \quad +1$

$-1 < x < 3$

$x \in (-1, 3)$

"lives in"

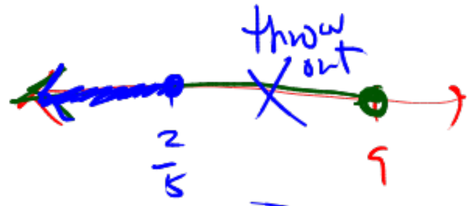
Practice: Solve:

(1) $7 \le 3x + 5 \le 15$

$-5 \qquad -5 \qquad -5$

$2 \le 3x \le 10$

$$\boxed{\frac{2}{3} \le x \le \frac{10}{3}}$$



$x \le 2/5$

(2) $7x + 1 \le 2x + 3 \le x + 12$

$7x + 1 \le 2x + 3$

$-1 \qquad -1$

$7x \le 2x + 2$

$5x \le 2 \Rightarrow x \le \frac{2}{5}$

$2x + 3 \le x + 12$

$2x \le x + 9$

$x \le 9$

Intersect these because your answer must satisfy both inequalities

(3) $|x - 4| < 14$

$-14 < x - 4 < 14$

$$\boxed{-10 < x < 18}$$

Ex. $\left|\dfrac{x-7}{-3}\right| \le 2$

$\left|\dfrac{13-7}{-3}\right| = \left|\dfrac{6}{-3}\right|$

$= |-2|$

$= 2$ ✓

$\left|\dfrac{A}{B}\right| = \dfrac{|A|}{|B|}$ always true

$\dfrac{|x-7|}{|-3|} \le 2$

$\dfrac{|x-7|}{3} \le 2$

$|x-7| \le 6$

$$\begin{array}{ccccc} -6 & \le & x-7 & \le & 6 \\ +7 & & +7 & & +7 \\ \hline \end{array}$$

$\boxed{1 \le x \le 13}$

Ex.

$$5|1-x|+3 < 10$$
$$\quad -3 \qquad -3$$

$$\frac{5|1-x|}{5} < \frac{7}{5}$$

$$|1-x| < \frac{7}{5}$$

$$\star \quad -\frac{7}{5} < 1-x < \frac{7}{5}$$
$$-1 \qquad -1 \qquad -1$$

$$\frac{-12}{5} = \frac{-5}{5} - \frac{7}{5} < -x < \frac{-5}{5} + \frac{7}{5} = \frac{2}{5}$$

$$\Rightarrow \frac{-12}{5} < -x < \frac{2}{5}$$

$$\boxed{\frac{12}{5} > x > \frac{-2}{5}}$$

More Inequalities & Absolute Value - Section 1.6 & 1.7

horiz. line line horiz. line

Ex. $13 \le -12x + 1 \le 37$

$-1 \qquad -1 \qquad -1$

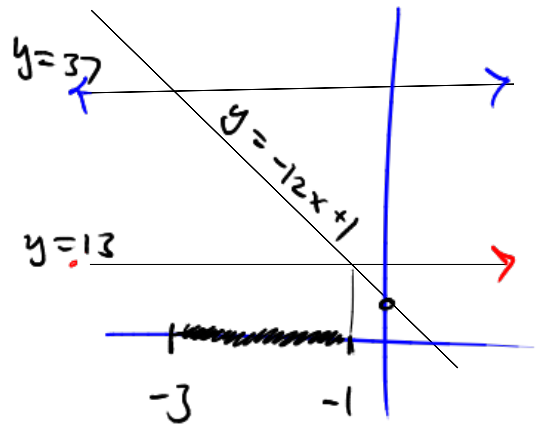
$12 \le -12x \le 36$

$\frac{}{-12} \qquad \frac{}{-12} \qquad \frac{}{-12}$

$-1 \ge x \ge -3$

Solve: find x-values so that both inequalities are true.

" $x \le -1$ & $x \ge -3$



Ex. Solve

$$\boxed{3x+1 \le 2x+7 \le 5x-4}$$

$3x+1 \le 2x+7$

$-2x \qquad -2x$

$x+1 \le 7$

$x \le 6$

$2x+7 \le 5x-4$

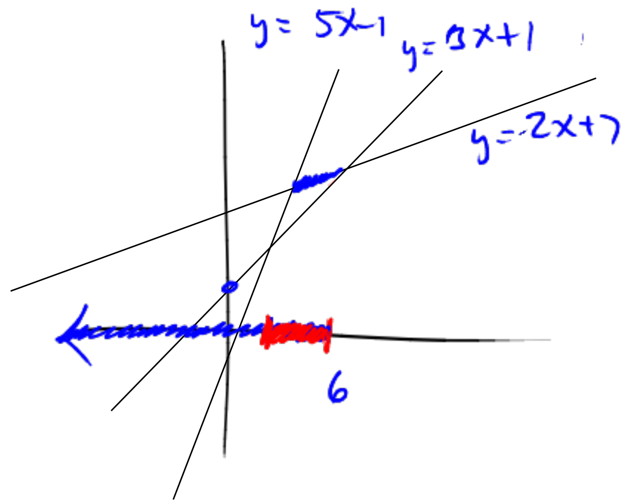
$-2x \qquad -2x$

$7 \le 3x-4$

$11 \le 3x$

$\frac{11}{3} \le x$

greater than $\frac{11}{3}$



$\frac{11}{3} \le x \le 6$

Practice: Solve.

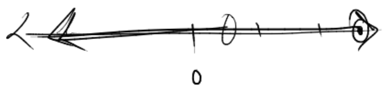
$7x - 4 \le 5x + 1 \le 3x + 2$

$7x - 4 \le 5x + 1$ $\qquad$ $5x + 1 \le 3x + 2$

$2x \le 5$ $\qquad$ $2x \le 1$

$x \le \frac{5}{2}$ $\qquad$ $x \le \frac{1}{2}$

intersect these sets



$\boxed{x \le \frac{1}{2}}$

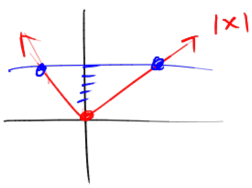
Absolute Value

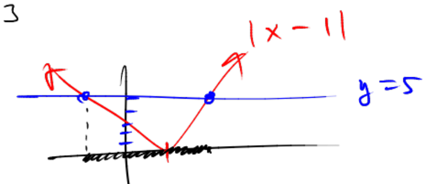
$$|x| = \begin{cases} x & \text{if } x \ge 0 \\ -x & \text{if } x < 0 \end{cases}$$

$|x| = 5$

$x = \{-5, 5\}$

$$|-3| = \begin{cases} -3 & -3 \ge 0 \\ -(-3) & -3 < 0 \end{cases} = 3$$





Ex. $|x-1| < 5$ — This Problem ... 1st step

$x - 1 < 5$

$-5 < x - 1$

or $\boxed{-5 < x - 1 < 5}$

$\quad +1 \qquad\qquad +1$

$-4 < x < 6$

$\Rightarrow x \in (-4, 6)$

"lives in".

Ex. $\left| \dfrac{x-7}{-5} \right| \le 2$ $\qquad$ ⊛ $\left| \dfrac{A}{B} \right| = \dfrac{|A|}{|B|}$

$\dfrac{|x-7|}{|-5|} \le 2$ $\qquad$ $|x-7| \le 10$

$-10 \le x - 7 \le 10$

$\dfrac{|x-7|}{5} \le 2 \Rightarrow$ $\qquad$ $-3 \le x \le 17$

$x \in [-3, 17]$

PRACTICE

① $5|x+1|-3 < 4$

$\quad +3 \qquad +3$

$5|x+1| < 7$

$-7 < 5(x+1) < 7 \Rightarrow -7 < 5x+5 < 7 \Rightarrow -12 < 5x < 2$

$\quad -5 \qquad -5 \qquad -5$

$\frac{-12}{5} < \frac{5x}{5} < \frac{2}{5}$

$\frac{-5}{5} \qquad \frac{-5}{5}$

$-\frac{7}{5} < x+1 < \frac{7}{5} \Rightarrow -\frac{12}{5} < x < \frac{2}{5}$

$\qquad -1$

$\boxed{-\frac{12}{5} < x < \frac{2}{5}}$

② $|1-x| < 12$

$-12 < 1-x < 12 \Rightarrow -13 < -x < 11 \Rightarrow \boxed{13 > x > -11}$

$\quad -1 \qquad -1 \qquad -1 \qquad\qquad \div -1 \quad \div -1 \quad \div -1$

③ $4-x \le 3x+1.5 \le x+1$

$4-x \le 3x+1.5$

$\quad +x \qquad +x$

$4 \le 4x+1.5$

$\frac{2.5}{4} \le x$

$.625 \le x$

$3x+1.5 \le x+1$

$\quad -x \qquad -x$

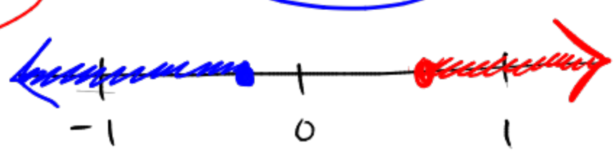
$2x+1.5 \le 1$

$2x \le -.5$

$x \le \frac{-\frac{1}{2}}{2} = \frac{-1}{4}$

$x \le -.25$

No solutions



Name: **MA111 :: Exam 1 :: September 17, 2015**

For full credit, circle your answers and show all your work!

1. Factor the expression completely.

$$x^5 + 6x^3 + x^2 + 6$$

$(x^5+6x^3)+1(x^2+6)$

$x^3(x^2+6)+1(x^2+6)$

$(x^2+6)(x^3+1)$

$\sqrt{y^5} = \sqrt{y^4 \cdot y} = \sqrt{y^4}\sqrt{y}$
$= y^2\sqrt{y}$

2. **Simplifying Expression**
   Simplify the expression

$$\sqrt{x^2y^5}\,\sqrt[3]{x^3y^2}\,\sqrt[5]{x^3}$$

into the form x^ry^s.

$\sqrt{x^2}\sqrt{y^5}\sqrt[3]{x^3}\sqrt[3]{y^2}\sqrt[5]{x^3}$

$x \quad y^2 y^{\frac{1}{2}} x \, y^{\frac{2}{3}} x^{3/5}$

$\frac{12}{6}+\frac{3}{6}+\frac{4}{6}$

$x^{\frac{10}{5}} x^{\frac{3}{5}} \quad y^2 y^{\frac{1}{2}} y^{\frac{2}{3}}$

$\boxed{x^{13/5}\, y^{19/6}}$

3. **Factoring**
   Factor the following expression:

$$3x^2 + 17x - 28 = (3x-4)(x+7)$$

4. Express the expression without parentheses:

$$(3a + 7c)(b - 2d)$$

FOIL

$$3ab - 3a2d + 7cb - 14cd$$

$$\boxed{3ab - 6ad + 7bc - 14dc}$$

5. Rationalize the Numerator:

$$\left(\frac{\sqrt{a+h} - a}{h}\right)\frac{\left(\sqrt{a+h} + a\right)}{\sqrt{a+h} + a}$$

$$\frac{1}{2} \cdot \frac{2}{2} = \frac{2}{4} = \frac{1}{2}$$

Vs.

$$\frac{(1)^2}{(2)^2} = \frac{1}{4} \neq \frac{1}{2}$$

$$\frac{(a+h) + \boxed{a\sqrt{a+h} - a\sqrt{a+h}} - a^2}{h\left(\sqrt{a+h} + a\right)}$$

$$\boxed{\frac{a+h-a^2}{h\left(\sqrt{a+h}+a\right)}}$$

6. Simplify the expression

$$\frac{(x+4)}{(x+4)}\frac{2}{x+3}-\frac{1}{\underbrace{x^2+7x+12}_{(x+3)(x+4)}}$$

$$\frac{2x+8}{(x+4)(x+3)}-\frac{1}{(x+3)(x+4)}=\boxed{\frac{2x+7}{(x+4)(x+3)}}$$

7. Simplify the expression

$$\frac{\frac{y}{y}\frac{y}{x}-\frac{x}{y}\frac{x}{x}}{\frac{x^2}{x^2}\frac{1}{y^2}-\frac{1}{x^2}\frac{y^2}{y^2}}=\frac{\frac{y^2-x^2}{yx}}{\frac{x^2-y^2}{x^2y^2}}$$

$$\frac{x^2}{x^2y^2}-\frac{y^2}{x^2y^2}$$

$$\frac{y^2-x^2}{\cancel{yx}}\cdot\frac{x^{\cancel{2}}y^{\cancel{2}}}{x^2-y^2}=\frac{(y^2-x^2)xy}{(x^2-y^2)}=\frac{\cancel{(y^2-x^2)}xy}{-1\cancel{(y^2-x^2)}}=\boxed{-xy}$$

8. Factor the expression completely and simplify your answer. Write your answer with positive exponents. Begin by factoring out the lowest power of each common factor.

$$7x^3(x^2+3)^{-1/3}-x^2(x^2+3)^{-4/3}$$

$$x^2(x^2+3)^{-4/3}\left(7x(x^2+3)^{-1/3-(-4/3)}-1\right)$$

$$\boxed{\frac{x^2\cdot(7x(x^2+3)-1)}{(x^2+3)^{4/3}}}$$

Immediate Loss of 5 points when I see : $(x+h)^2 = x^2 + h^2$.

Name: **MA111 :: Exam 1 :: September 17, 2015** $\boxed{2x+h}$

9. Perform the indicated operations and simplify:

$$\frac{(x+h)^2 - x^2}{h}$$

FOIL

$(x+h)(x+h)$

$$\frac{x^2 + \boxed{xh + hx} + h^2 - x^2}{h} =$$

$$\frac{2xh + h^2}{h}$$

$$\frac{\cancel{h}(2x+h)}{\cancel{h}}$$

10. **Simplifying Expressions**
Simplify the expression

multiply exponents

$$\left(\frac{a^5y^2b^3x^{-5}y^{-2}}{x^4y^3x^8b^5a^8}\right)^{-3}$$

$(x^4)^3 = x^4 \cdot x^4 \cdot x^4$
x^{12}

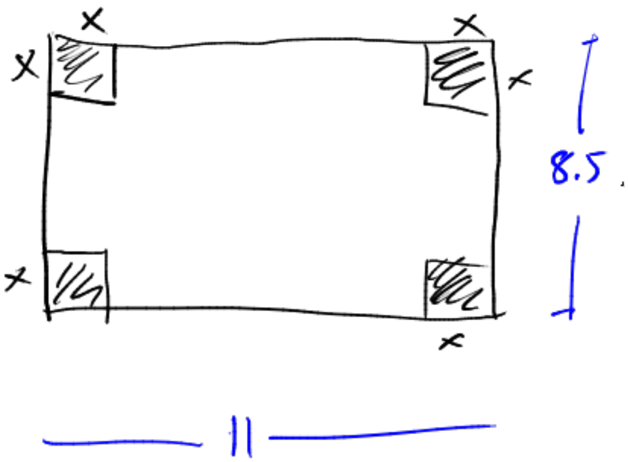
$\frac{b^{15}}{b^9} = b^{15-9} = b^6$

and give your answer with positive exponents.

$$\left(\frac{x^4y^3x^8b^5a^8}{a^5y^2b^3x^{-5}y^{-2}}\right)^3 = \frac{x^{12}y^9x^{24}b^{15}a^{24}}{a^{15}y^6b^9x^{-15}y^{-6}} = x^{\overbrace{(12+24+15)}^{51}} y^9 b^6 a^9$$

$$\boxed{x^{51}y^9b^6a^9}$$

11. So far this class is ____________________



Box

Depth: x

Length: $11 - 2x$

Width: $8.5 - 2x$

$$\text{Volume} = L \cdot W \cdot D$$

$$= \underbrace{(11-2x)(8.5-2x)}(x)$$

$$= x(93.5 - 22x - 17x + 4x^2)$$

$$\text{Volume} = 4x^3 - 39x^2 + 93.5x$$

Name: **MA111 :: Exam 1 :: September 17, 2015**

For full credit, circle your answers and show all your work!

1. Factor the expression completely.

$$x^5 + 6x^3 + x^2 + 6$$

$(x^5 + 6x^3) + 1(x^2+6)$

$x^3(x^2+6) + 1(x^2+6) = (x^2+6)(x^3+1)$

$= (x^2+6)(x+1)(x^2-x+1)$

$\sqrt{y^5} = \sqrt{y^4 \cdot y} = \sqrt{y^4}\sqrt{y} = y^2\sqrt{y} = y^2 y^{\frac{1}{2}}$

2. **Simplifying Expression**
   Simplify the expression

$$\sqrt{x^2y^5}\,\sqrt[3]{x^3y^2}\,\sqrt[5]{x^3}$$

into the form $\boxed{x^r y^s}$

$\frac{10}{5} + \frac{3}{5} = \frac{13}{5}$

$2 + \frac{1}{2} + \frac{2}{3} = \frac{12}{6} + \frac{3}{6} + \frac{4}{6}$

$\sqrt{x^2}\sqrt{y^5}\sqrt[3]{x^3}\sqrt[3]{y^2}\sqrt[5]{x^3}$

$x^1 y^2 y^{1/2} x^1 y^{2/3} x^{3/5}$

$x^{(1+1+3/5)} \cdot y^{(2+\frac{1}{2}+\frac{2}{3})} = \boxed{x^{\frac{13}{5}} y^{\frac{19}{6}}}$

1 28
2 14
4 7

3. **Factoring**
   Factor the following expression:

$$3x^2 + 17x - 28 = (3x - 4)(x + 7)$$

4. Express the expression without parentheses:

$$(3a + 7c)(b - 2d)$$

Foil.

$$\boxed{3ab - 6ad - 7bc - 14cd}$$

5. Rationalize the Numerator:

$$\frac{(\sqrt{a+h} - a)^2}{(h)^2} \cdot \frac{\sqrt{a+h} + a}{\sqrt{a+h} + a}$$

$$\frac{(a+h) + a\sqrt{a+h} - a\sqrt{a+h} - a^2}{h(\sqrt{a+h} + a)}$$

$$\boxed{\frac{a+h-a^2}{h(\sqrt{a+h} + a)}}$$

$$(4)^2 = (2 \cdot 2)^2$$

$$16 = 2^2 \cdot 2^2$$

$$\frac{(1)^2}{(2)^2} = \frac{1}{4} \qquad \frac{1}{2}\left(\frac{2}{2}\right)$$

6. Simplify the expression

$$\frac{(x+4)}{(x+4)}\frac{2}{x+3} - \frac{1}{\underbrace{x^2+7x+12}_{(x+3)(x+4)}} = \boxed{\frac{2x+7}{(x+4)(x+3)}}$$

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

7. Simplify the expression

$$\frac{\frac{y}{y}\frac{y}{x} - \frac{x}{y}\frac{x}{x}}{\frac{x^2}{x^2}\frac{1}{y^2} - \frac{1}{x^2}\frac{y^2}{y^2}} = \frac{\frac{y^2}{yx} - \frac{x^2}{yx}}{\frac{x^2}{x^2y^2} - \frac{y^2}{x^2y^2}} = \frac{\frac{y^2-x^2}{yx}}{\frac{x^2-y^2}{x^2y^2}}$$

$$\underbrace{-1(x^2-y^2)}$$

$$\frac{y^2-x^2}{\cancel{yx}} \cdot \frac{\cancel{x^2y^2}}{\cancel{x^2-y^2}}$$

$$-xy$$

8. Factor the expression completely and simplify your answer. Write your answer with positive exponents. Begin by factoring out the lowest power of each common factor.

$$7x^3(x^2+3)^{-1/3} - x^2(x^2+3)^{-4/3}$$

$$\boxed{x^2(x^2+3)^{-4/3}}\left(7x\,\underbrace{(x^2+3)}^{\boxed{-1/3-(-4/3)}} - 1\right)$$

$$\boxed{\frac{x^2\left(7x(x^2+3)^1 - 1\right)}{(x^2+3)^{4/3}}}$$

$(x+h)^2 \neq x^2 + h^2$

Name: **MA111 :: Exam 1 :: September 17, 2015**

9. Perform the indicated operations and simplify:

$$\frac{(x+h)^2 - x^2}{h}$$

$$(x+h)(x+h) = \frac{x^2 + hx + xh + h^2 - x^2}{h}$$

$2x+h$

$$\frac{2xh + h^2}{h} = \frac{\cancel{h}(2x+h)}{\cancel{h}}$$

10. **Simplifying Expressions**
Simplify the expression

$$\left(\frac{a^5y^2b^3x^{-5}y^{-2}}{x^4y^3x^8b^5a^8}\right)^{-3}$$

and give your answer with positive exponents.

$$\left(\frac{x^4y^3x^8b^5a^8}{a^5y^2b^3x^{-5}y^{-2}}\right)^3 = \frac{x^{4\cdot3}y^{3\cdot3}x^{8\cdot3}b^{5\cdot3}a^{8\cdot3}}{a^{5\cdot3}y^{2\cdot3}b^{3\cdot7}x^{-5\cdot3}y^{-2\cdot3}}$$

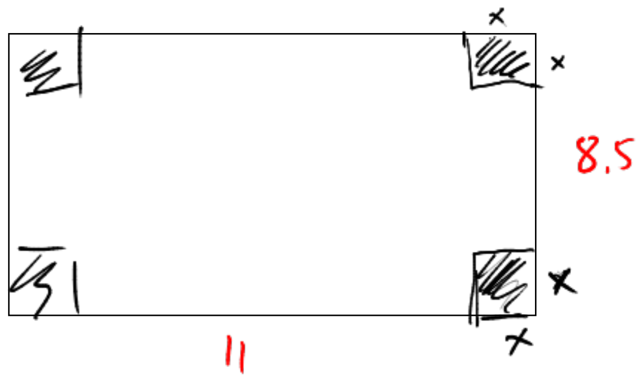
$$= \frac{x^{12}y^9x^{24}b^{15}a^{24}}{a^{15}y^6b^9x^{-15}y^{-6}} = x^{\overbrace{(12+24+15)}^{51}}y^9b^6a^9$$

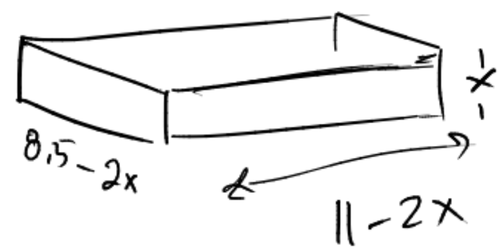
$15-9=6$

$24-15$

11. So far this class is ______________________

$$\boxed{x^{51}y^9b^6a^9}$$





Box

Height = x

Length = $11-2x$

width = $8.5-2x$

$11 \times 8.5 = 88 + \frac{11}{2} = 88 + 5.5 = 93.5$

$$Vol = L \cdot W \cdot H$$

$$= (11-2x)(8.5-2x)(x)$$

$$= (93.5 - 22x - 17x + 4x^2)\,x$$

$$\boxed{V = 4x^3 - 39x^2 + 93.5x}$$