

Name: _____
PC

Date: _____
Ms. Loughran

Do Now:

Factor each of the following completely.

1. $16r^4s + 2rs^4$

$$2rs(8r^3 + s^3)$$
$$2rs(2r+s)(4r^2 - 2rs + s^2)$$

2. $16m^4 - 81$

$$(4m^2 - 9)(4m^2 + 9)$$
$$(2m - 3)(2m + 3)(4m^2 + 9)$$

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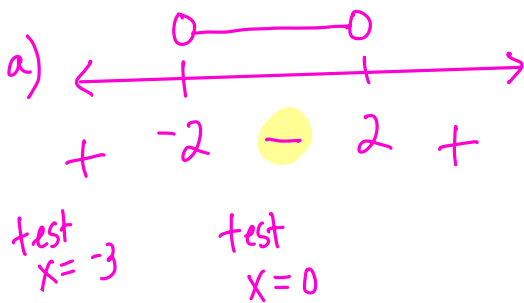
PC: Solving Non-Linear Inequalities

Ms. Loughran

For each inequality below, express its solution set 3 ways:

- (a) As a number line. *(graphically)*
- (b) Using set-builder notation.
- (c) Using interval notation.

1. $(x+2)(x-2) < 0$ *negative*

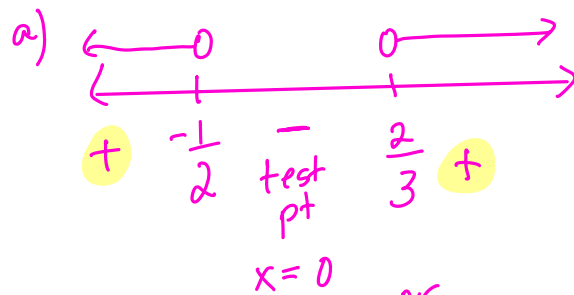


b) $\{x \mid -2 < x < 2\}$

"the set of all x's such that -2 is less x is less than 2"

c) $(-2, 2)$

3. $(2x+1)(3x-2) > 0$ *positive*

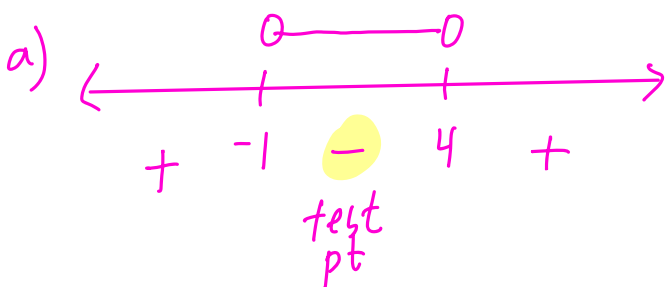


b) $\{x \mid x < -\frac{1}{2} \text{ or } x > \frac{2}{3}\}$

c) $(-\infty, -\frac{1}{2}) \cup (\frac{2}{3}, \infty)$

8. $2t^2 - 6t - 8 < 0$

$2(t^2 - 3t - 4) < 0$
 $2(t-4)(t+1) < 0$



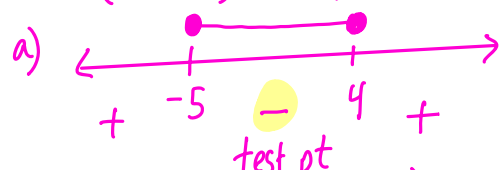
b) $\{t \mid -1 < t < 4\}$ c) $(-1, 4)$

5. $20 - c - c^2 \geq 0$ *rearrange*

follow the inequality sign you have after you factored

$\frac{-c^2}{-1} - \frac{c}{-1} + \frac{20}{-1} \geq \frac{0}{-1}$

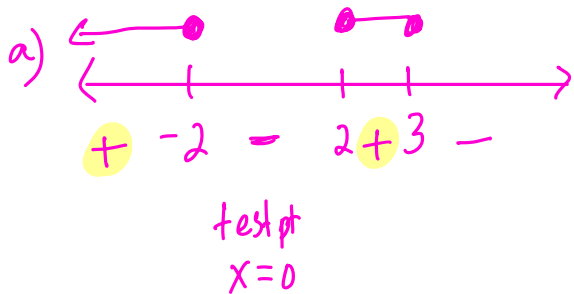
$c^2 + c - 20 \leq 0$
 $(c+5)(c-4) \leq 0$



b) $\{c \mid -5 \leq c \leq 4\}$ c) $[-5, 4]$

* in an inequality when you divide or multiply by a negative number, you must flip the inequality sign

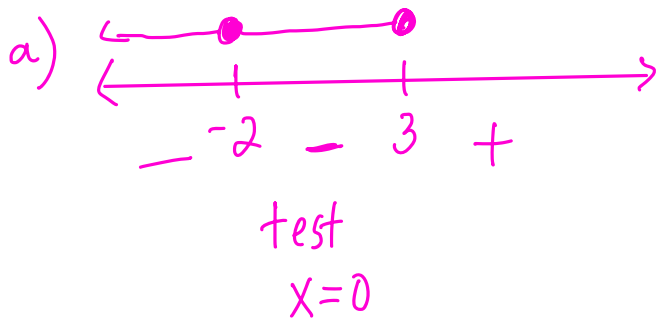
$$18. \overset{-}{(x-3)}\overset{+}{(2-x)}\overset{+}{(x+2)} \geq 0$$



b) $\{x \mid x \leq -2 \vee 2 \leq x \leq 3\}$

c) $(-\infty, -2] \cup [2, 3]$

$$20. \overset{-}{(x-3)}\overset{+}{(x+2)^2} \leq 0$$



b) $\{x \mid x \leq 3\}$

c) $(-\infty, 3]$

* The signs in your sign chart do not alternate around the critical value that came from a factor being raised to an even power

Now try #s 19 and 22

19. $(x+3)(x+2)(x-1) \geq 0$

22. $4x^3 \geq 4x^2 + 24x$

Classwork/Homework 09-09

①

$$a^2 - 121b^4$$

$$\textcircled{1} (a - 11b^2)(a + 11b^2)$$

$$8 - 27a^3$$

$$\textcircled{2} (2 - 3a)(4 + 6a + 9a^2)$$

$$\textcircled{3} a^2 + 2b - 2a - ab$$

$$a^2 - ab + 2b - 2a$$

$$a(a - b) - 2(a - b)$$

$$(a - 2)(a - b)$$

$$\textcircled{4} x^2 - y - x + xy$$

$$x^2 - x + xy - y$$

$$x(x - 1) + y(x - 1) \rightarrow (x + y)(x - 1)$$

$$\textcircled{5} 7x^3 + 7h^3$$

$$7(x^3 + h^3)$$

$$7(x + h)(x^2 - xh + h^2)$$

$$\textcircled{6} 40ab^3 - 5a^4$$

$$5a(8b^3 - a^3)$$

$$5a(2b - a)(4b^2 + 2ab + a^2)$$

$$\textcircled{7} 5x^2 + 31x + 6$$

$$5x^2 + 30x + x + 6$$

$$5x(x + 6) + 1(x + 6) \rightarrow (5x + 1)(x + 6)$$

$$\begin{aligned}
 & \textcircled{8} \quad 8x^2 - 16x + 6 \\
 & \quad 2(4x^2 - 8x + 3) \\
 & \quad 2(4x^2 - 6x - 2x + 3) \\
 & \quad 2(2x(2x-3) - 1(2x-3)) \\
 & \quad 2(2x-1)(2x-3)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{9} \quad 12a^2 - 25a + 12 \\
 & \quad 12a^2 - 16a - 9a + 12 \\
 & \quad 4a(3a-4) - 3(3a-4) \\
 & \quad (4a-3)(3a-4)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{10} \quad 15(2x+1)^2 + (2x+1) - 2 \\
 & \quad \text{let } y = 2x+1 \\
 & \quad 15y^2 + y - 2 \\
 & \quad 15y^2 + 6y - 5y - 2 \\
 & \quad 3y(5y+2) - 1(5y+2)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{11} \quad 3p^2 - 7p - 6 \\
 & \quad 3p^2 - 9p + 2p - 6 \\
 & \quad 3p(p-3) + 2(p-3) \\
 & \quad (3p+2)(p-3)
 \end{aligned}$$

$$\begin{aligned}
 & \quad (3y-1)(5y+2) \\
 & \quad (3(2x+1)-1)(5(2x+1)+2) \\
 & \quad (6x+2)(10x+7) = 2(3x+1)(10x+7)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{12} \quad 6x^2 + 7x - 10 \\
 & \quad 6x^2 + 12x - 5x - 10 \\
 & \quad 6x(x+2) - 5(x+2) \\
 & \quad (6x-5)(x+2)
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{13} \quad 4t^2 - 9t + 6 \\
 & \quad \text{prime}
 \end{aligned}$$

$$\textcircled{14} \quad 2(x^2-7)^2 - 3(x^2-7) - 2$$

$$\begin{aligned}
 & \quad \text{let } y = x^2-7 \\
 & \quad 2y^2 - 3y - 2 \\
 & \quad 2y^2 - 4y + y - 2 \\
 & \quad 2y(y-2) + 1(y-2)
 \end{aligned}$$

$$\begin{aligned}
 & \rightarrow (2y+1)(y-2) \\
 & \quad (2(x^2-7)+1)(x^2-7-2) \\
 & \quad (2x^2-14+1)(x^2-9) \\
 & \quad (2x^2-13)(x-3)(x+3)
 \end{aligned}$$

15) $(x^3-2)^2 - 3(x^3-2) - 18$
 let $y = x^3-2$
 $y^2 - 3y - 18$
 $(y-6)(y+3)$
 $(x^3-2-6)(x^3-2+3)$
 $(x^3-8)(x^3+1)$
 $(x-2)(x^2+2x+4)(x+1)(x^2-x+1)$

16) $p^5q - pq$
 $pq(p^4-1)$
 $pq(p^2-1)(p^2+1)$
 $pq(p-1)(p+1)(p^2+1)$

17) $xy + 2 - 2y - x$
 $xy - x - 2y + 2$
 $x(y-1) - 2(y-1)$
 $(x-2)(y-1)$

~~18) $x^2 - 6x + 9 - 4y^2$
 $(x-3)^2 - 4y^2$
 $(x-3-2y)(x-3+2y)$~~

~~19) $z^2 + 2z + 1 - w^2$
 $(z+1)^2 - w^2$
 $(z+1-w)(z+1+w)$~~

~~20) $x^2 - y^2 + 2y - 1$
 $x^2 - (y^2 - 2y + 1)$
 $x^2 - (y-1)^2$
 $(x-(y-1))(x+(y-1))$
 $(x-y+1)(x+y-1)$~~

~~21) $a^2 - b^2 - 4b - 4$
 $a^2 - (b^2 + 4b + 4)$
 $a^2 - (b+2)^2$
 $(a-(b+2))(a+(b+2))$
 $(a-b-2)(a+b+2)$~~

22) $81x^3 - 16y^4$
 $(9x^4 - 4y^2)(9x^4 + 4y^2)$
 $(3x^2 - 2y)(3x^2 + 2y)(9x^4 + 4y^2)$

$$\begin{aligned} & \textcircled{2} \quad x^2 - y^2 - 5x + 5y \\ & \quad (x-y)(x+y) - 5(x-y) \\ & \quad (x-y)(x+y-5) \end{aligned}$$

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For each inequality below, express its solution set 3 ways:

- (a) As a number line.
- (b) Using set-builder notation.
- (c) Using interval notation.

1. $(x+2)(x-2) < 0$

2. $(x+3)(2x+1) \geq 0$

3. $(2x+1)(3x-2) > 0$

4. $x^2 - 7x + 10 < 0$

5. $20 - c - c^2 \geq 0$

6. $s^2 + 10 < 11s$

7. $d^2 + 6d > 0$

8. $2t^2 - 6t - 8 < 0$

9. $y^2 - 8y \leq 2y + 24$

10. $x^2 \geq 16$

11. $w^2 + 5w < 3 - w^2$

12. $33x < 4x^2 + 8$

13. $3(u^2 - u) \geq u^2 + 9$

14. $13(c+3) \leq 2(c^2 - 3)$

15. $3k^2 + 24k > -36$

16. $5 - 4x - x^2 < 0$

17. $u + 20 \geq u^2$

18. $(x-3)(2-x)(x+2) \geq 0$

19. $(x+3)(x+2)(x-1) \geq 0$

20. $(x-3)(x+2)^2 \leq 0$

21. $(x-1)^2(x+3) > 0$

22. $4x^3 \geq 4x^2 + 24x$

23. $5x^3 \leq 5x$

24. $y^3 + y^2 - 6y \leq 0$