Journal

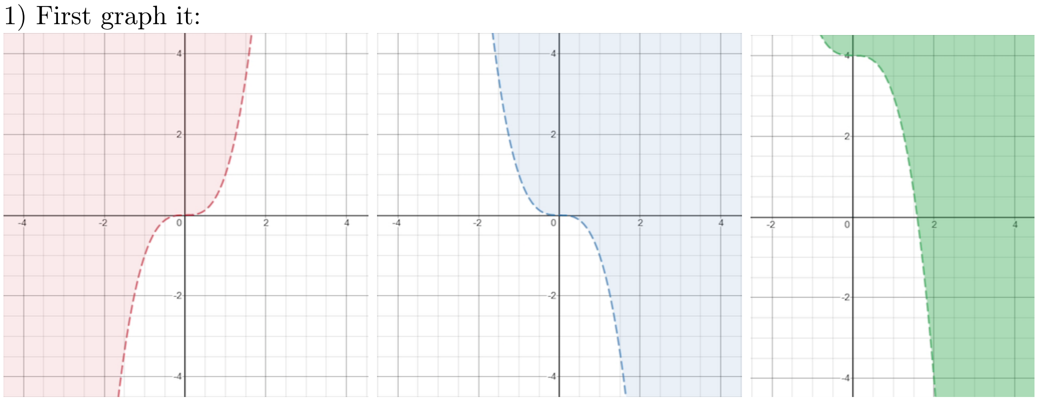
1 Review

Inequalities

One-Variable Inequalities
In the case of an inequality like $-3 \leq 1 - 2x < 4x$
You can split it up into two equations: $-3 \leq 1 - 2x$, $1 - 2x < 4x$
As both are true, this is an "and" statement: $-3 \leq 1 - 2x$ and $1 - 2x < 4x$
From here, you can simplify to get a final answer: $2x \leq 4 \rightarrow x \leq 2$ and $-6x < -1 \rightarrow x > 1/6$
Finally: $x \leq 2$ AND $x > 1/6$
Alternatively: $1/6 < x \leq 2$

Two-Variable Inequalities
With a two-variable inequality like $y > -x^3 + 4$

1) First graph it:



In this case, I am graphing the base function, $y = x^3$
Then flipping it across the y-axis: $y = -x^3$
Finally adding the $+4$ and transforming up 4: $y = -x^3 + 4$

2) Second, test a point $(0, 0)$:
We find that it is out of the solution set.
This means that the area this inequality represents is above the line.
We know it is dotted as $>$ or $<$ inequalities are non-inclusive.

Absolute Value Inequalities
Although they share similarities to normal inequalities, they are solved differently.

In the case of $3|2x + 1| > 12$:

1) Isolate the absolute value: $|2x + 1| > 4$

2) Separate into 2 equations. Absolute value inequalities are or, not and.

Equation 1: $+(2x + 1) > 4 \rightarrow 2x > 3 \rightarrow x > 2/3$
Equation 2: $-(2x + 1) > 4 \rightarrow 2x + 1 < -4 \rightarrow 2x < -5 \rightarrow x < -5/2$

Finally: $x < -5/2$ OR $x > 2/3$

Quadratic Forms

General Form: $ax^2 + bx + c$
Example: $x^2 + 6x + 9$
A determines whether the parabola opens up/down (-a is down)
B moves the axis of symmetry from side to side
C is the Y intercept
Vertex: $(-b/2a)$, $(f(-b/2a))$ (Ex: (-3), (0))
Axis of Symmetry: $-b/2a$ (Ex: -3)
Y-Intercept: C (Ex: 9)
X-Intercept: Solve (Ex: -3)

Vertex Form: $a(x - h)^2 + k$
Example: $-2(x - 4)^2 + 2$
$(-H, K)$ is the vertex, A is the same as general form
Vertex: $(-h, k)$ (Ex: $(4, 2)$)
Axis of Symmetry: h (Ex: 4)
Y-Intercept: Set $x = 0$, solve for y (Ex: -30)
X-Intercept: Set $y = 0$, solve for x (Ex: (3, 0), (5, 0))

Factored Form: $a(x - r)(x - s)$
Example: $(x + 3)(x + 2)$
$(-R, -S)$ are the X intercepts, A is the same as general form
Vertex: Get the average of the x-intercepts, substitute (Ex: (-2.5, -0.25))
Axis of Symmetry: $(r + s)/2$ (Ex: -2.5)
Y-intercept: Set $x = 0$, solve for y (Ex: 6)
X-Intercept: $(-r, -s)$ (Ex: (0, -3), (0, -2))

Quadratic Patterns

Difference of Squares
$a^2 - b^2 = (a - b)(a + b)$
Example: $9x^2 - 64 = (3x + 8)(3x - 8)$

Difference of Cubes
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
(On the right side, first sign is same, second is opposite, last is $+$).
Example: $2^3 + 5^3 = (2 + 5)(2^2 - 10 + 5^2)$

Perfect Square Trinomial
Must satisfy requirement of $b^2 = 4ac$
Example: $x^2 + 6x + 9$
$6^2 = 4 * 1 * 9 \rightarrow 36 = 36$
$(x + 3)(x + 3)$

Quadratic Methods

Factor By Grouping
$3t^3 + 6t^2 + 2t + 4$
Take out common monomials for first 2 and last 2 (can rearrange nums)
$3t^2(t+2) + 2(t+2)$
$(3t^2+2)(t+2)$

Into 2 Binomials
$x^2 + 7x + 12$
Fill in last number of each paren: (+4)(+3) - have to add to 7, multiply to 12
$x^2 + bx + c$
(+d) (+e) - D and E have to add up to B and multiply to C

Quadratic Formula : $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
Example: $x^2 + 3x + 2$
$x = \frac{-3 \pm \sqrt{3^2-4*1*2}}{2*1}$
$x = \frac{-3 \pm \sqrt{1}}{2}$
Finally: -1 and -2 are returned from the formula.

Completing the Square
Example: $x^2 + 4x + 1$
1) Divide equation by a
Ex: Skip, $a = 1$
2) Move c to the opposite side of the equation
Ex: $x^2 + 4x = -1$
3) Create a perfect square trinomial by completing operations on each side
Ex: $x^2 + 4x + 4 = 3$
$(x+2)^2 = \pm 3$
$\rightarrow$ Resulting equation should follow the form $(x+p)^2 \ = \pm q$
4) $\sqrt{}$ equation
Ex: $x + 2 = \pm$ 1.73
5) Solve for x
Ex: $x = \ -3.73$ or $x = \ -0.27$

2 Question

I am curious as to whether there is a shortcut to completing the square like how the quadratic formula is.

3 Notes to Ms. Zanca

I tried typing my journal up this time because it was a bit longer. Hopefully it's fine. The quadratic patterns, methods, forms all took quite a bit of space and I also hope it's not too long to read. On another note, I had a nice, relaxing, weekend and am ready to return to school. I've also been practicing on IXL a bit, albeit inconsistently. I'm trying to work it into my schedule right now, but I'm just getting busier and busier.