

Math for 3D/Games Programmers

Intro

<https://wojtsterna.com/math-for-3d-programmers>

<https://wojtsterna.com>

Who Am I, Anyway?

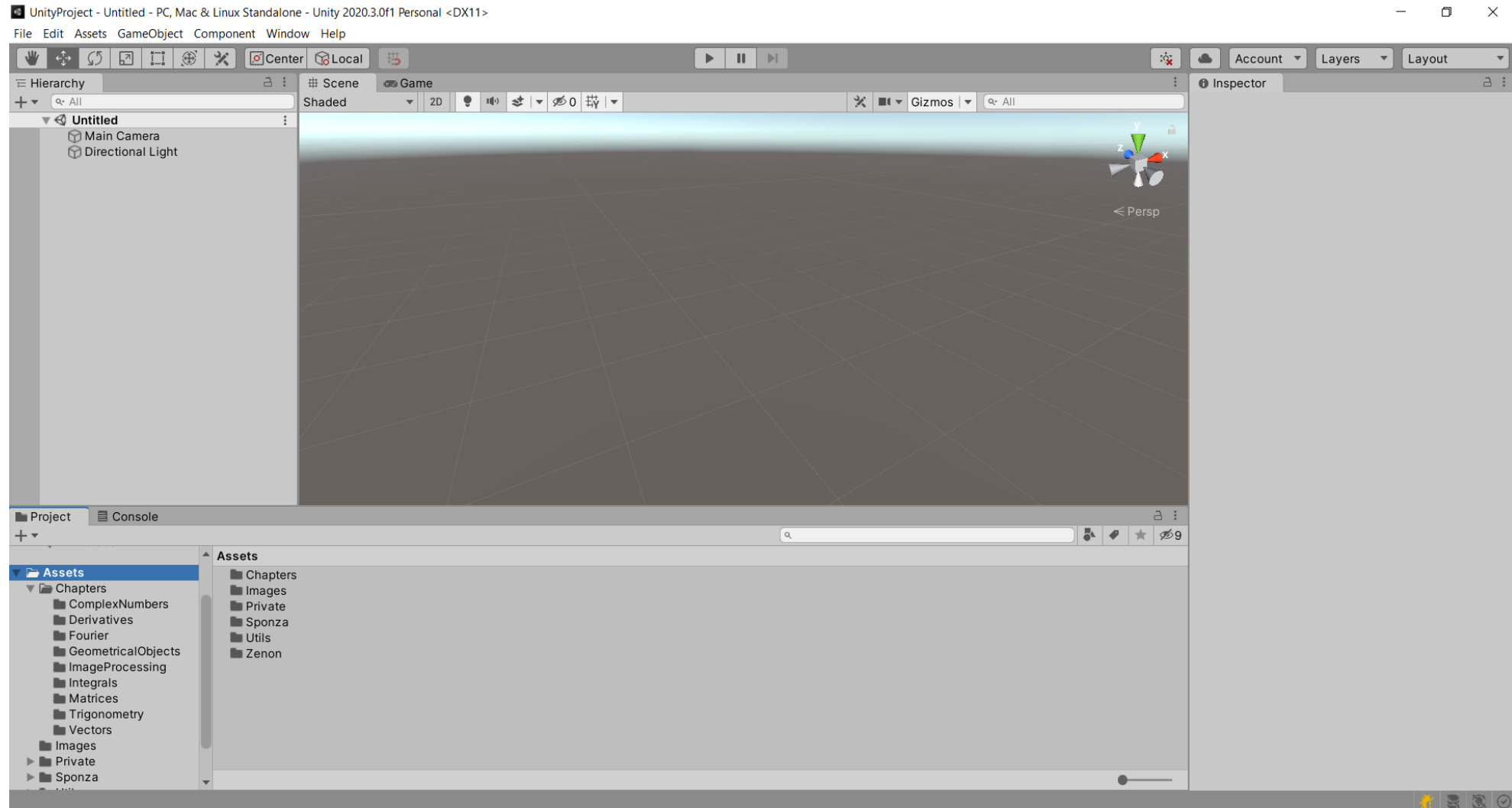
- Wojtek Sterna
- I am a software engineer who's worked in video games professionally for well over 10 years now. Mostly as an engine/graphics programmer
- I've worked at companies like NVIDIA, id Software, CD PROJEKT RED and Flying Wild Hog
- <https://wojtsterna.com>



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Unity



Unity

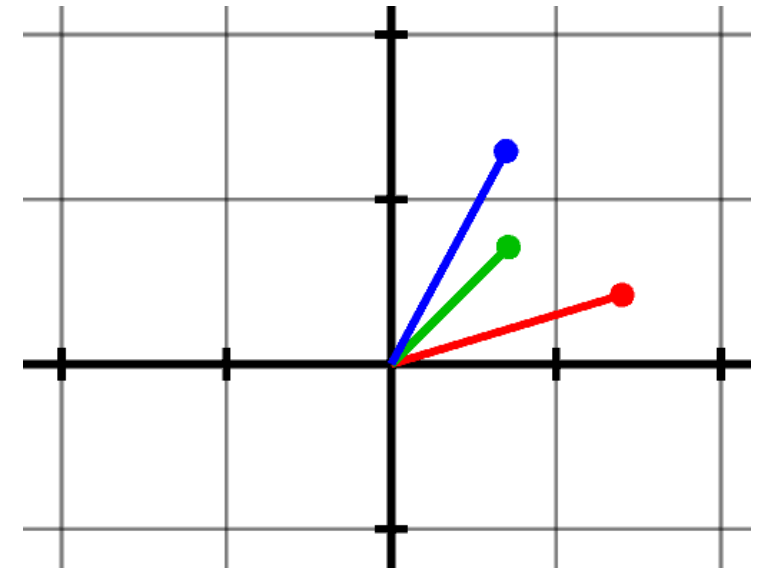
- Zenon – a helper library for 2D/3D drawing

```
ComplexNumbers.cs  X
Assembly-CSharp  ComplexNumbers.Complex

Unity Message | 0 references
void Update()
{
    Zenon.CanvasWidth = 10.0f;
    Zenon.DrawRect(Zenon.GetCanvasWidth(), Zenon.GetCanvasHeight(), 10000, Color.white);
    Zenon.DrawCoordSystem(true, 15.0f, 10.0f, 1.0f, 0.05f, 10001);

    c3 = Complex.Mul(c1, c2);

    Zenon.DrawCircle(c1.a, c1.b, 0.075f, 10002, Color.red);
    Zenon.DrawCircle(c2.a, c2.b, 0.075f, 10003, Zenon.ColorGreen075);
    Zenon.DrawCircle(c3.a, c3.b, 0.075f, 10004, Color.blue);
    Zenon.DrawSegment(0.0f, 0.0f, c1.a, c1.b, 0.05f, 10002, Color.red);
    Zenon.DrawSegment(0.0f, 0.0f, c2.a, c2.b, 0.05f, 10003, Zenon.ColorGreen075);
    Zenon.DrawSegment(0.0f, 0.0f, c3.a, c3.b, 0.05f, 10004, Color.blue);
}
```



Wolfram

The screenshot shows the WolframAlpha website interface. At the top, the browser tab is titled "5 - x = 3, find x - Wolfram|Alpha". The address bar shows the URL "https://www.wolframalpha.com/input?i=5+-x+%3D+3%2C+find+x". The page features a navigation bar with links for "UPGRADE TO PRO", "APPS", "TOUR", and a "Sign in" button. A festive banner with cartoon characters and confetti is displayed, with the text "Volume of a cylinder? Piece of cake." and a button that says "Unlock Step-by-Step". The main heading is "WolframAlpha computational intelligence." Below this is a search bar containing the input "5 - x = 3, find x". Under the search bar are two tabs: "NATURAL LANGUAGE" and "MATH INPUT". To the right of the tabs are links for "EXTENDED KEYBOARD", "EXAMPLES", "UPLOAD", and "RANDOM". The "Input interpretation" section shows the input broken down into "solve", "5 - x = 3", "for", and "x". The "Result" section displays the solution "x = 2" and includes a checkbox for "Step-by-step solution" which is currently checked.

5 - x = 3, find x - Wolfram|Alpha

https://www.wolframalpha.com/input?i=5+-x+%3D+3%2C+find+x

UPGRADE TO PRO APPS TOUR Sign in

Volume of a cylinder? Piece of cake.

Unlock Step-by-Step

WolframAlpha computational intelligence.

5 - x = 3, find x

NATURAL LANGUAGE MATH INPUT

EXTENDED KEYBOARD EXAMPLES UPLOAD RANDOM

Input interpretation

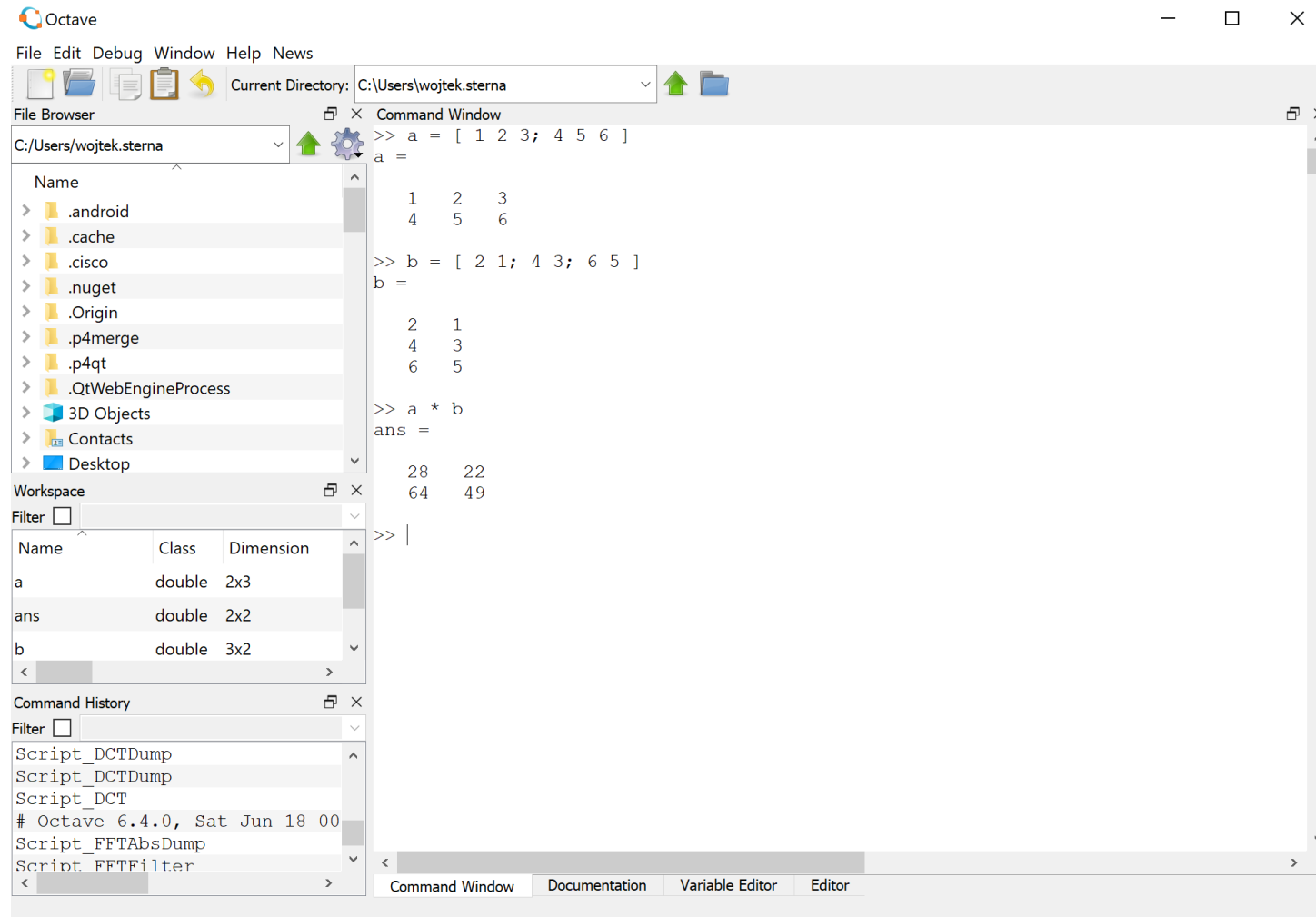
solve 5 - x = 3 for x

Result

x = 2

Step-by-step solution

Octave



Σ Notation

- We use this notation to more compactly describe a sum of elements
- Instead of writing a series like this:

$$S(n) = 1 + 3 + 5 + \cdots + (2n - 1)$$

we can write it down more concisely like so:

$$S(n) = \sum_{i=1}^n (2i - 1)$$

Bibliography

- [3D Math Primer for Graphics and Game Development](#)
- [Mathematics for 3D Game Programming and Computer Graphics](#)
- [Engineering Mathematics, K. A. Stroud](#)
- Many other sources to which references will be given as we go along