

Math for 3D/Games Programmers

Intro

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

<https://wojtsterna.com>

Who Am I, Anyway?

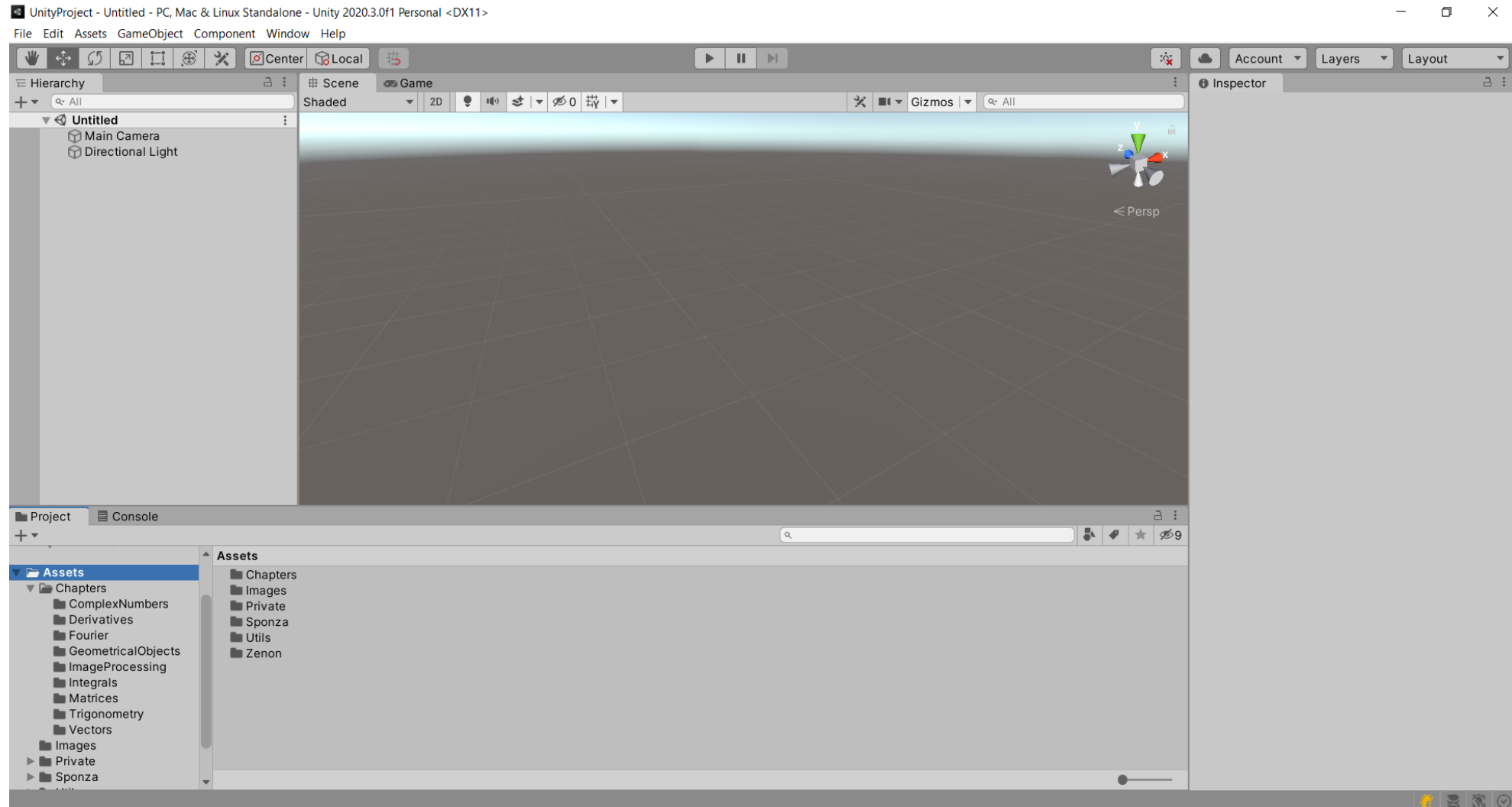
- Wojtek Sterna
- I am a software engineer who's worked in video games professionally for well over 10 years now. Mostly as an engine/graphics programmer
- I've worked at companies like NVIDIA, id Software, CD PROJEKT RED and Flying Wild Hog
- <https://wojtsterna.com>



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Unity



Unity

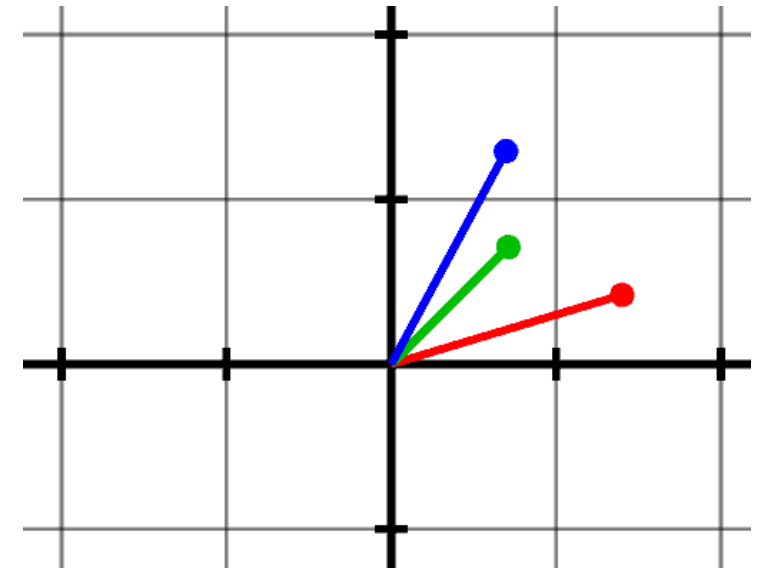
- Zenon – a helper library for 2D/3D drawing

```
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 navigation bar includes links for "UPGRADE TO PRO", "APPS", "TOUR", and a "Sign in" button. A promotional banner for "Volume of a cylinder? Piece of cake." features a pink "Unlock Step-by-Step" button and a colorful illustration of cartoon characters celebrating with balloons and a cake. Below the banner is the WolframAlpha logo with the tagline "computational intelligence". The main input area contains the query "5 - x = 3, find x". Below the input field are buttons for "NATURAL LANGUAGE" and "MATH INPUT", and links for "EXTENDED KEYBOARD", "EXAMPLES", "UPLOAD", and "RANDOM". The "Input interpretation" section shows the query broken down into "solve", "5 - x = 3", "for", and "x". The "Result" section displays the solution "x = 2" and a checkbox for "Step-by-step solution" which is 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

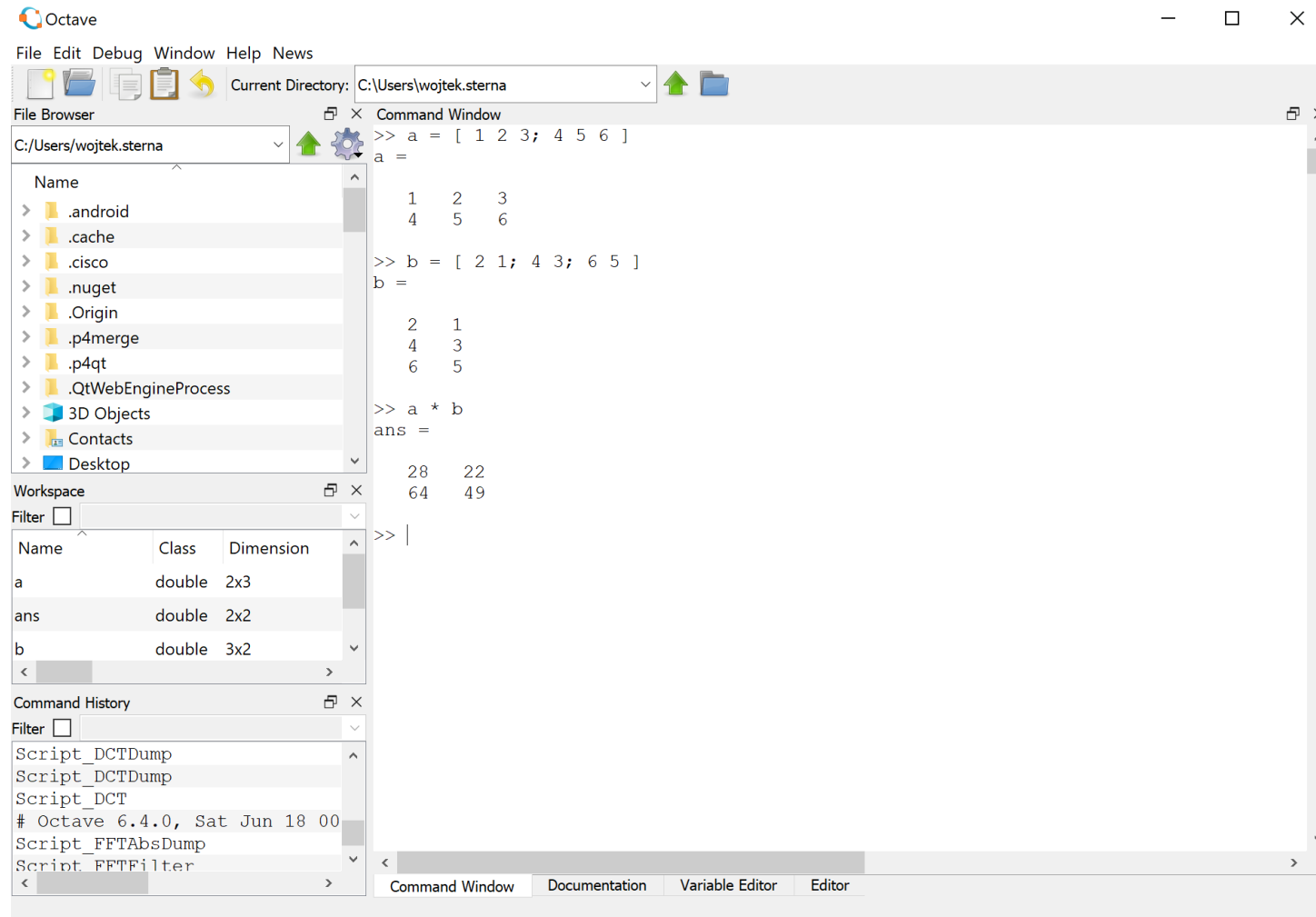
solve 5 - x = 3 for x

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](#)
- <https://tutorial.math.lamar.edu>
- Many other sources to which references will be given as we go along