

Discussion Class 1

January 9, 2024

Today:

1. Introductions, admin, syllabus *
2. Pre-Calculus Review.

* For 1. see slides.

2. Pre-Calculus Review.

One of the first things you learn in Mathematics is that division by 0 is not allowed. We say it is undefined.

When solving equation with real numbers we need to keep this in mind.

Example 1: Solve for the real number x in the following equation.

$$x^3 - x^2 = 0$$

Solution: Factor out x^2 to get

$$(x^2)(x-1) = 0.$$

Then $x^2 = 0$ or $x-1 = 0$

If $x^2 = 0$, then $x = 0$.

If $x-1 = 0$, then $x = 1$.

Hence $x=0$ and $x=1$ solves the equation

Warning: We don't know at the start if x is 0 or not.

So we cannot say

~~$$\frac{x^3 - x^2}{x^2} = 0$$~~

$$\Rightarrow x-1 = 0 \Rightarrow x=1.$$

← x^2 could be 0 so this is undefined.

Example 2: Solve for x in

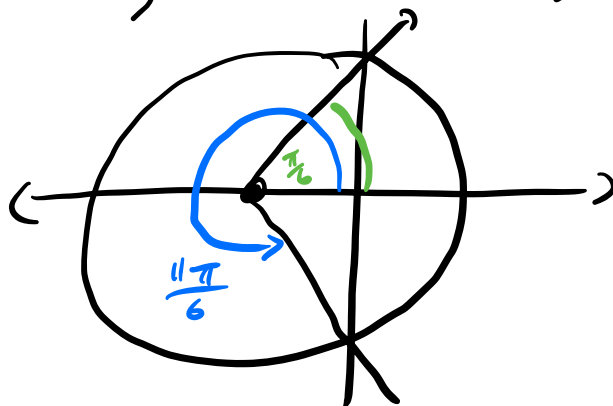
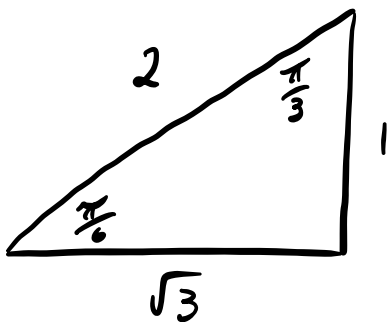
$$2 \cos^2(x) - \sqrt{3} \cdot \cos(x) = 0.$$

Solution: We use the same idea as in example 1, just with $\cos(x)$ instead of x .

Step 1: Factor out $\cos(x)$ to get
 $(\cos(x))(2\cos(x) - \sqrt{3}) = 0.$

Step 2: $\cos(x) = 0$ or $2\cos(x) - \sqrt{3} = 0$
If $\cos(x) = 0$, then $x = \frac{\pi}{2}$ or $\frac{3\pi}{2}$

If $2\cos(x) - \sqrt{3} = 0$, then $\cos(x) = \frac{\sqrt{3}}{2}.$



So $\cos(x) = \frac{\sqrt{3}}{2}$

$\Rightarrow x = \frac{\pi}{6}$ and $x = 2\pi - \frac{\pi}{6} = \frac{11\pi}{6}$

• Solutions for the equation: $x = \frac{\pi}{6}, \frac{\pi}{2}, \frac{3\pi}{2}, \frac{11\pi}{6}.$