



SOEN 6011 : SOFTWARE ENGINEERING PROCESSES
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F2: Tangent Function, $\tan(x)$

Author

Zeyu Huang

<https://www.overleaf.com/project/62cdb1d5b13422add2cceb12>

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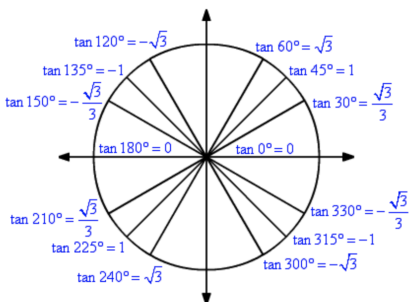
Problem1

Description of Function

[1] $\tan(x)$ is a periodic function which is very important in trigonometry. The simplest way to understand the tangent function is to use the unit circle. For a given angle measure θ draw a unit circle on the coordinate plane and draw the angle centered at the origin, with one side as the positive x -axis. The x -coordinate of the point where the other side of the angle intersects the circle is $\cos()$ and the y -coordinate is $\sin()$. So, the tangent function is define as below:

$$\tan(x) = \frac{\sin(x)}{\cos(x)}$$

The below graph shows values corresponding to different angles.



[1][2]The tangent function is undefined when $x = \pi / 2 + n\pi$ (where, n is integer) for which, $\cos(x) = 0$. However, Tangent function does not have an amplitude. In addition, The graph intercept x -axis at $n\pi$ (where n is integer) and in y -axis at $(0,0)$ point. The period of tangent function is π .

Range

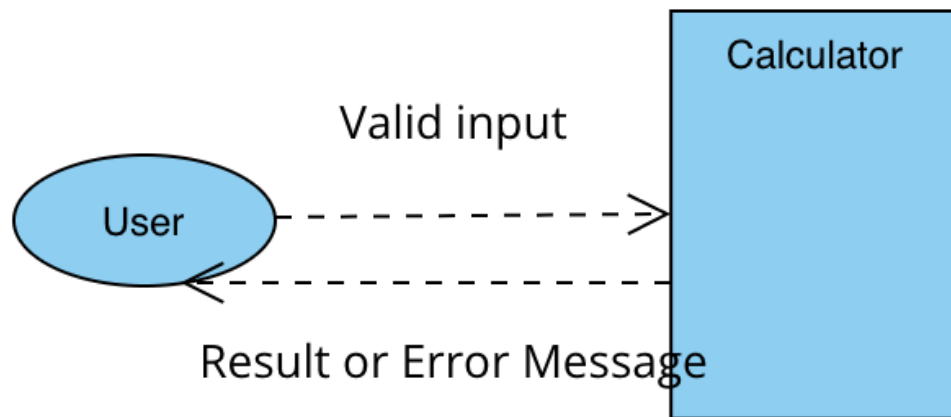
[1][2] The range of $\tan(x)$ is all real number \mathbb{R} , $(-\infty, +\infty)$.

Domain and Co-domain

[1][2] The domain of tangent function is $x \in \mathbb{R}$, $x \neq \pi / 2 + n\pi$ where, n is an integer. The co-domain of $\tan(x)$ is $(-\infty, +\infty)$.

Context of Use Model

Users can use the calculator to calculate the result of $\sin()$, $\cos()$ and $\frac{\sin()}{\cos()}$ which is $\tan()$ of a degree. This degree shall be an integer or decimal, so the digits $0-9$ and the decimal point must be available by the user. The user can select the appropriate function they want to use, and they shall be able to press a button to have the answer computed. The calculator should return the result or an error message that indicates why it was unable to do so.



Problem 2

Assumption:

For the given degree x , return the result of $\tan(x)$. If the input value is invalid or cannot be calculated, return an error message.

Requirements:

Requirement Id	R1
Overview	$x = 0^\circ + n\pi$
Description	For the given input $x = 0^\circ$, the function may return 0 as output.
Priority	High
Type	Functional
Difficulty	Easy

Requirement Id	R2
Overview	x is Positive Degree
Description	For the given input $x = \text{any Positive Degree}$, the function may return corresponding $\tan(x)$ value as output.
Priority	High
Type	Functional
Difficulty	Medium

Requirement Id	R3
Overview	x is Negative Degree
Description	For the given input $x = \text{any Negative Degree}$, the function may return corresponding $\tan(x)$ value as output.
Priority	High
Type	Functional
Difficulty	Medium

Requirement Id	R4
Overview	$x = 90^\circ + n\pi$
Description	For the given input x , the function may return "Invalid" as output.
Priority	High
Type	Functional
Difficulty	Hard

Bibliography

- [1] Varsity Tutors.
https://www.varsitytutors.com/hotmath/hotmath_help/topics/tangent-function
- [2] varsitytutors.graphing tangent function.
https://www.varsitytutors.com/hotmath/hotmath_help/topics/graphing-tangent-function