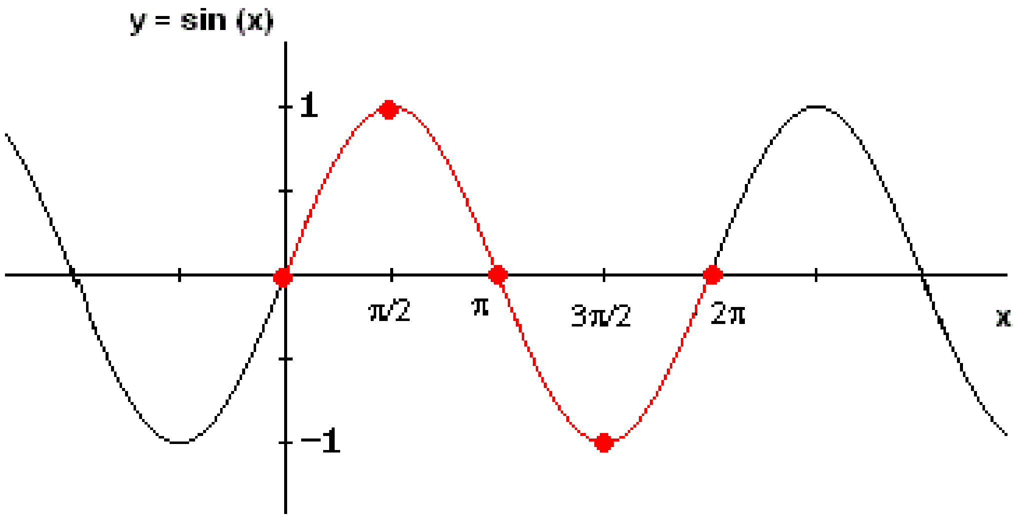
Trigonometric Functions

This worksheet covers the basic characteristics of the sine, cosine, tangent, cotangent, secant, and cosecant trigonometric functions.

Sine Function: f(x) = sin (x)

- Graph



- Domain: all real numbers
- Range: [-1 , 1]
- Period = 2π
- x intercepts: x = kπ , where k is an integer.
- y intercepts: y = 0
- Maximum points: (π/2 + 2kπ, 1), where k is an integer.
- Minimum points: (3π/2 + 2kπ, -1), where k is an integer.
- Symmetry: since sin (–x) = –sin (x) then sin(x) is an odd function and its graph is symmetric with respect to the origin (0, 0).
- Intervals of increase/decrease: over one period and from 0 to 2π, sin (x) is increasing on the intervals (0, π/2) and (3π/2 , 2π), and decreasing on the interval (π/2 , 3π/2).

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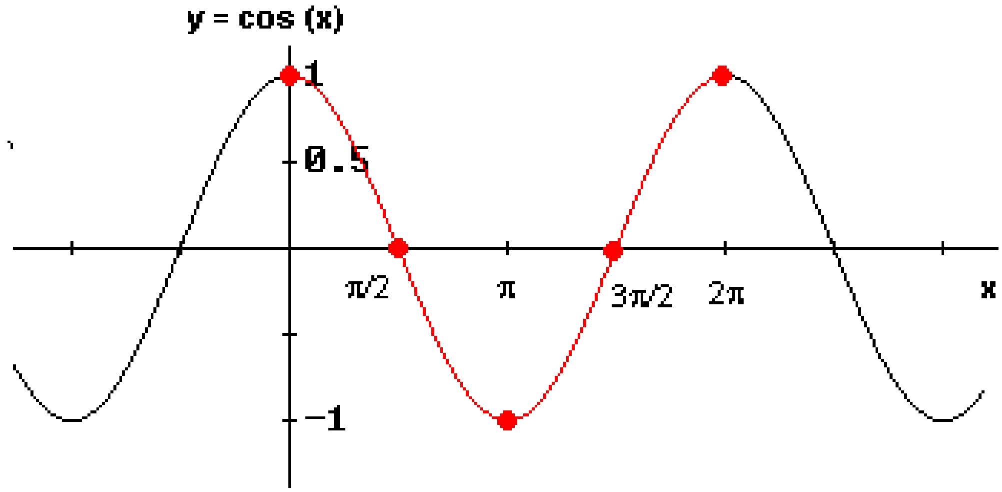
Cosine Function: f(x) = cos (x)

- Graph



- Domain: all real numbers
- Range: [–1 , 1]
- Period = 2π
- x intercepts: x = π/2 + k π , where k is an integer.
- y intercepts: y = 1
- Maximum points: (2 k π , 1) , where k is an integer.
- Minimum points: (π + 2 k π , –1) , where k is an integer.
- Symmetry: since cos(–x) = cos(x) then cos (x) is an even function and its graph is symmetric with respect to the y axis.
- Intervals of increase/decrease: over one period and from 0 to 2π, cos (x) is decreasing on (0 , π) increasing on (π , 2π).

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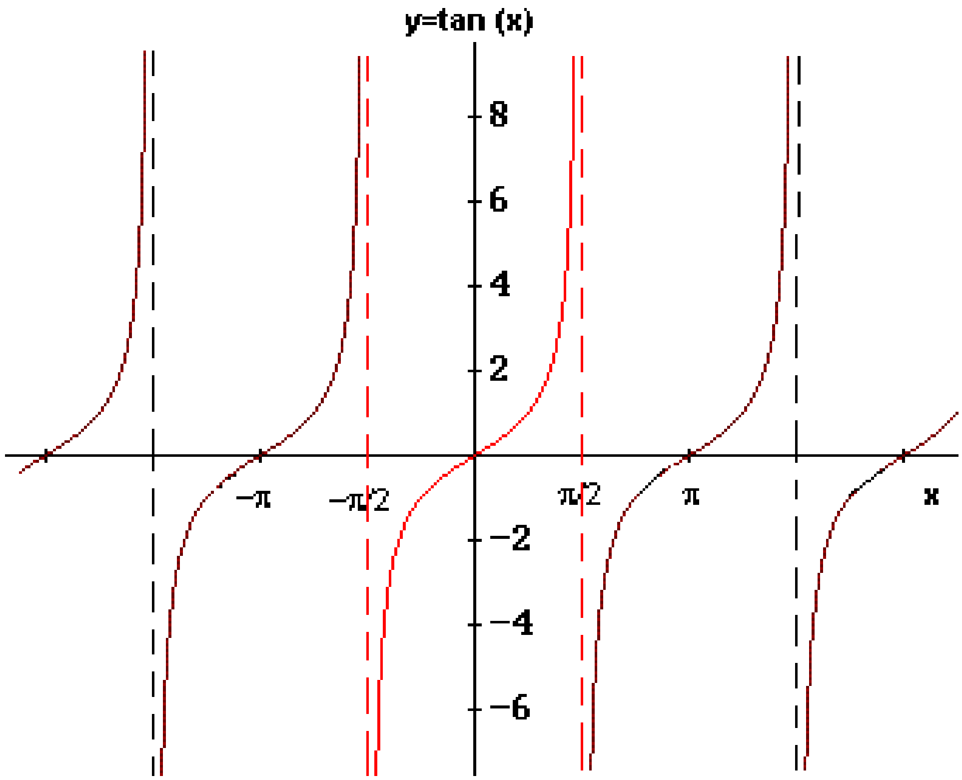
Tangent Function : f(x) = tan (x)

- Graph



- Domain: all real numbers except π/2 + k π, k is an integer.
- Range: all real numbers
- Period = π
- x intercepts: x = k π , where k is an integer.
- y intercepts: y = 0
- Symmetry: since tan(–x) = –tan(x) then tan (x) is an odd function and its graph is symmetric with respect the origin.
- Intervals of increase/decrease: over one period and from –π/2 to π/2, tan (x) is increasing.
- Vertical asymptotes: x = π/2 + kπ, where k is an integer.

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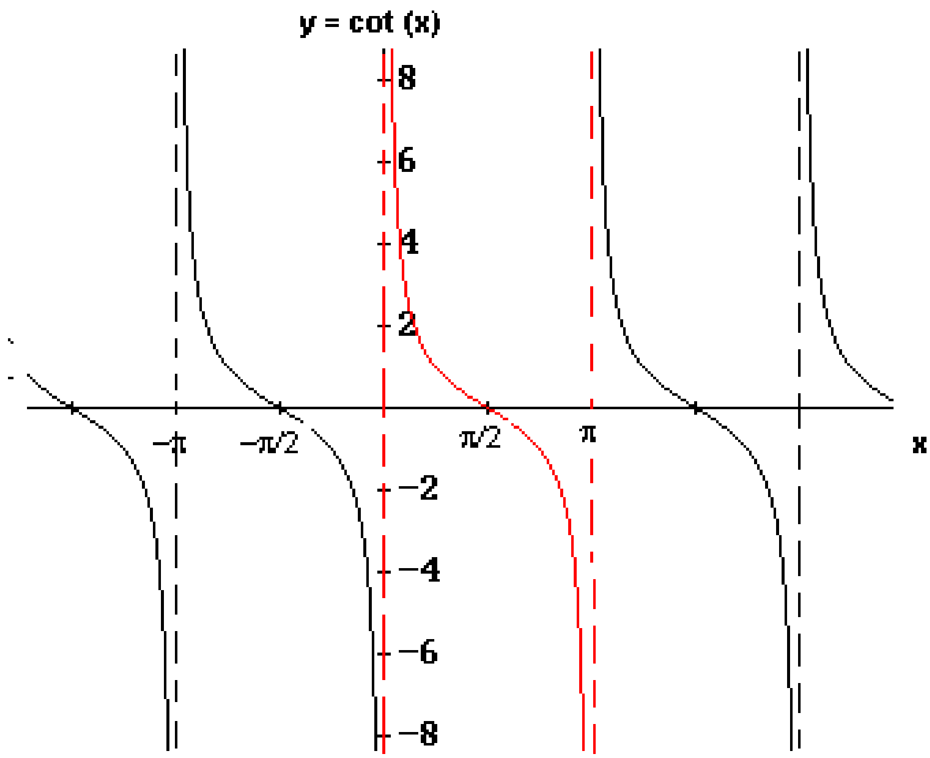
Cotangent Function : f(x) = cot(x)

- Graph



- Domain: all real numbers except k π, k is an integer.
- Range: all real numbers
- Period = π
- x intercepts: x = π /2 + k π , where k is an integer.
- Symmetry: since cot(–x) = –cot(x) then cot (x) is an odd function and its graph is symmetric with respect the origin.
- Intervals of increase/decrease: over one period and from 0 to π, cot (x) is decreasing.
- Vertical asymptotes: x = k π, where k is an integer.

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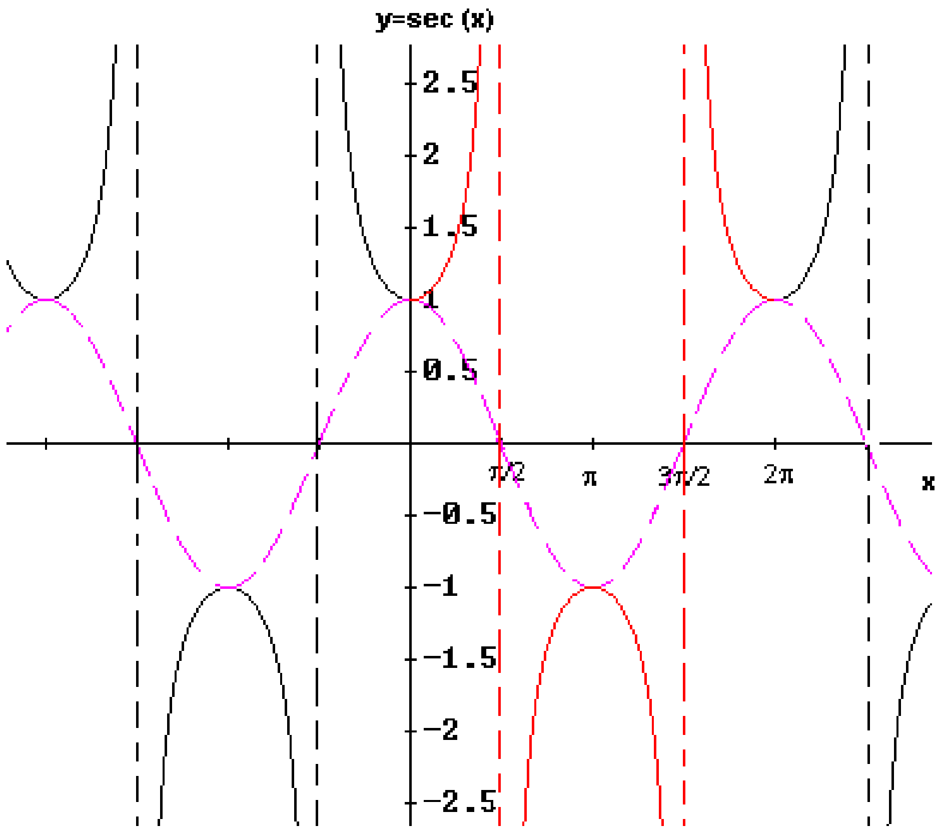
Secant Function: f(x) = sec (x)

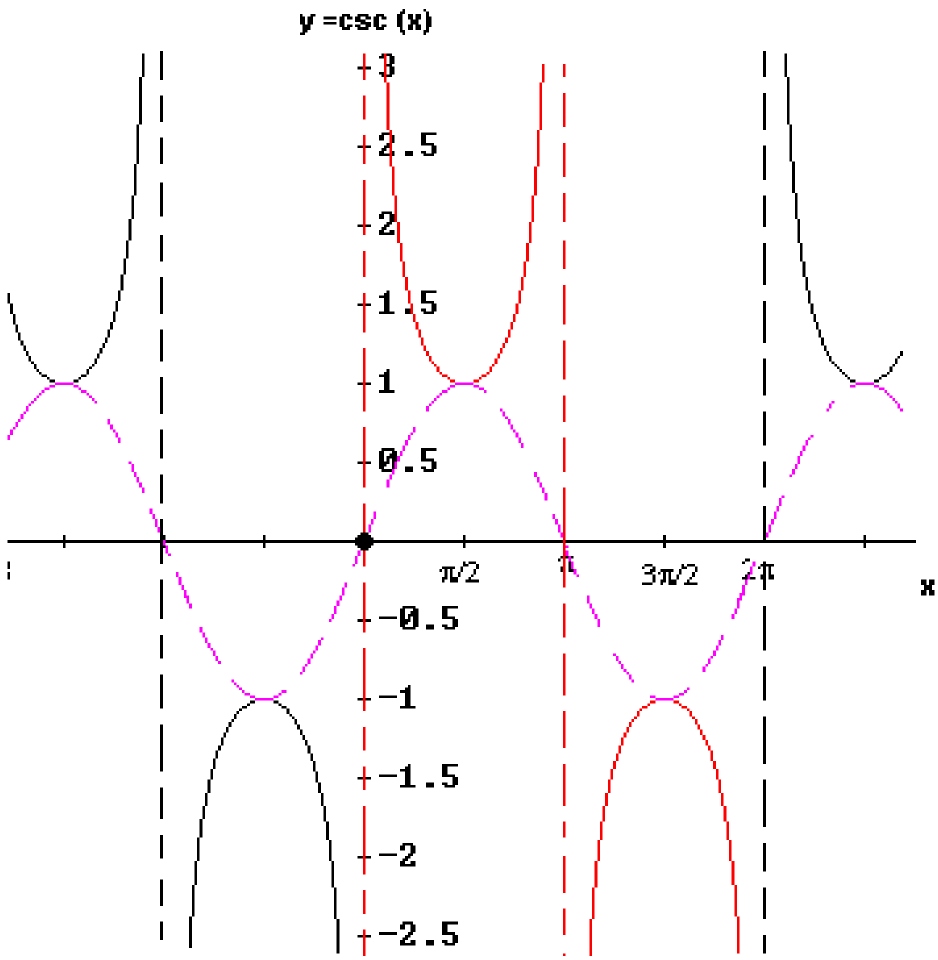
- Graph



- Domain: all real numbers except π/2 + k π, n is an integer.
- Range: (–ve infinity , –1] U [1 , +ve infinity)
- Period = 2π
- y intercepts: y = 1
- Symmetry: since sec(-x) = sec (x) then sec (x) is an even function and its graph is symmetric with respect to the y axis.
- Intervals of increase/decrease: over one period and from 0 to 2 π, sec (x) is increasing on (0 , π/2) U (π/2 , π) and decreasing on (π , 3π/2) U (3π/2 , 2π).
- Vertical asymptotes: x = π/2 + k π, where k is an integer.

Cosecant Function: f(x) = csc (x)

- Graph



- Domain: all real numbers except k π, k is an integer.
- Range: (-ve infinity , –1] U [1 , +ve infinity)
- Period = 2π
- Symmetry: since csc(–x) = –csc(x) then csc (x) is an odd function and its graph is symmetric with respect to the origin.
- Intervals of increase/decrease: over one period and from 0 to 2π, csc (x) is decreasing on (0 , π/2) U (3π/2 , 2π) and increasing on (π/2 , π) U (π / 3π/2).
- Vertical asymptotes: x = kπ, where k is an integer.