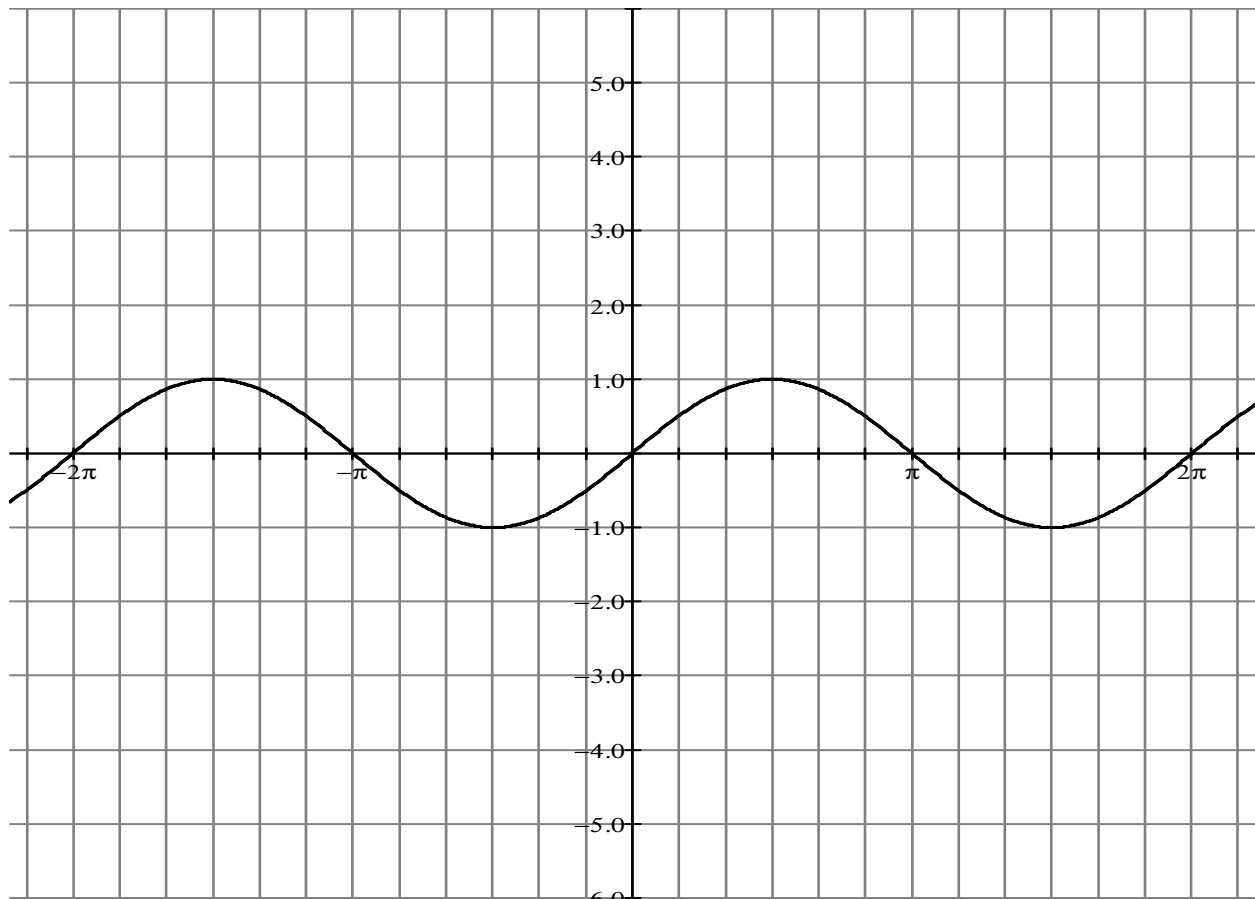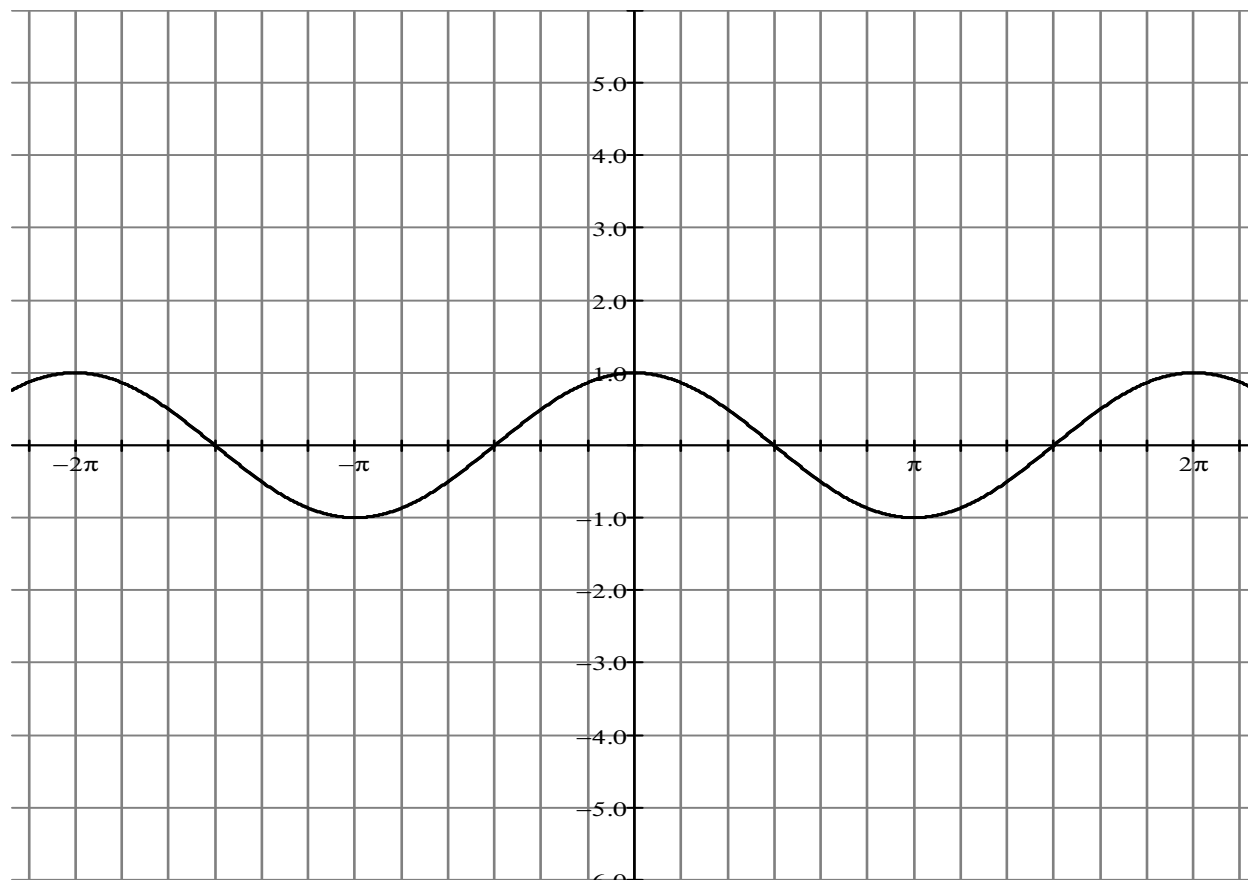Below is the graph of $y = \sin x$. Recalling that $\csc x = 1/\sin x$, sketch the graph of $y = \csc x$ in the interval $x \in [-2\pi, 2\pi]$.

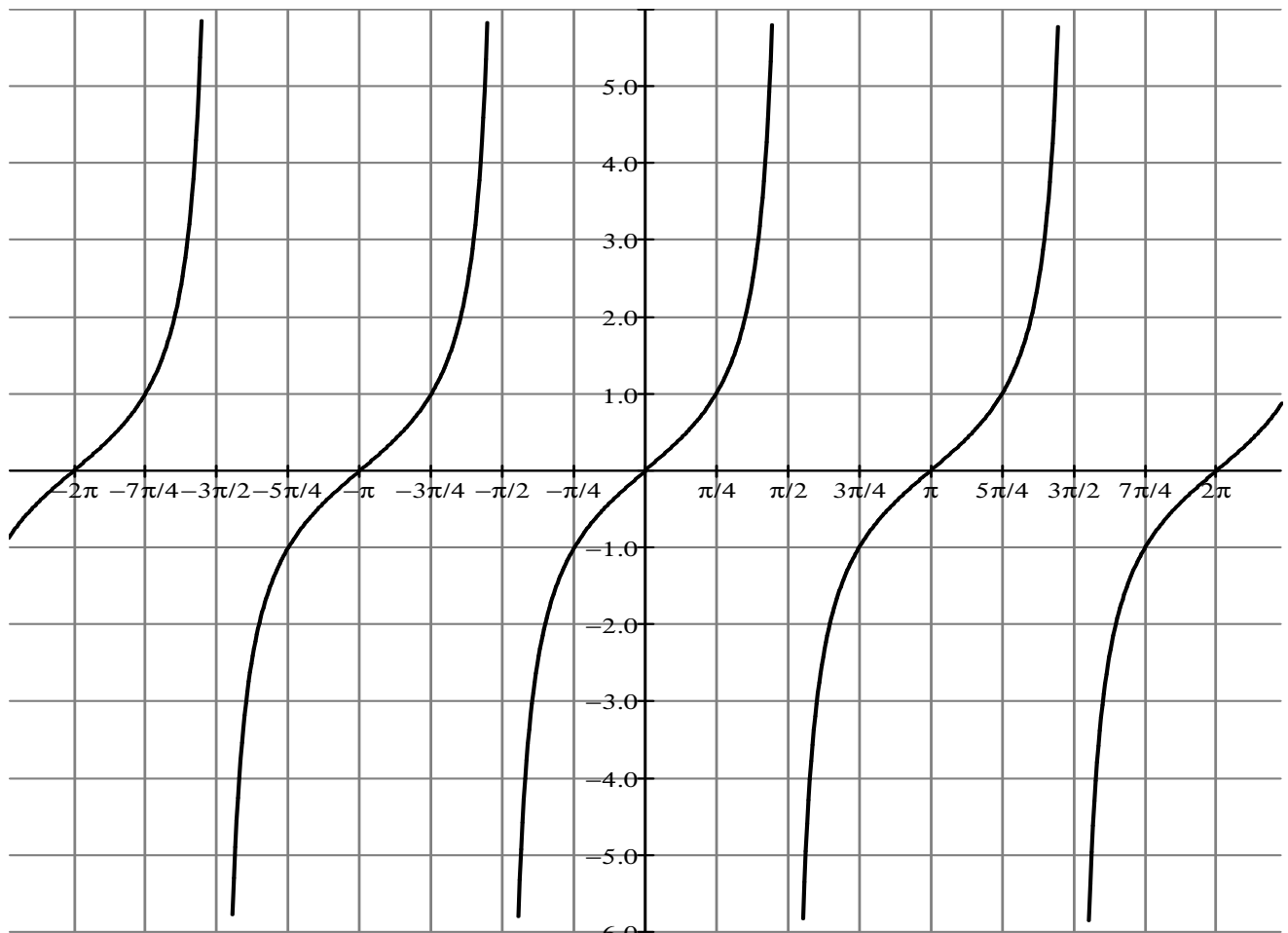| x	sin x	csc x
0	0	
π / 6	0.5	
π / 3	0.866	
π / 2	1	
2π / 3	0.866	
5π / 6	0.5	
π	0	
7π / 6	-0.5	
4π / 3	-0.866	
3π / 2	-1	
5π / 3	-0.886	
11π / 6	-0.5	
2π	0	

Below is the graph of $y = \cos x$. Recalling that $\sec x = 1/\cos x$, sketch the graph of $y = \sec x$ in the interval $x \in [-2\pi, 2\pi]$.

x	cos x	sec x
0	1	
π / 6	0.866	
π / 3	0.5	
π / 2	0	
2π / 3	-0.5	
5π / 6	-0.866	
π	-1	
7π / 6	-0.886	
4π / 3	-0.5	
3π / 2	0	
5π / 3	0.5	
11π / 6	0.866	
2π	1	

Below is the graph of $y = \tan x$. Recalling that $\cot x = 1/\tan x$, sketch the graph of $y = \cot x$ in the interval $x \in [-2\pi, 2\pi]$.

x	tan x	cot x
0	0	
π / 4	1	
π / 2	undef	
3π / 4	-1	
π	0	
5π / 4	1	
3π / 2	undef	
7π / 4	-1	
2π	0	

Complete the summary table.

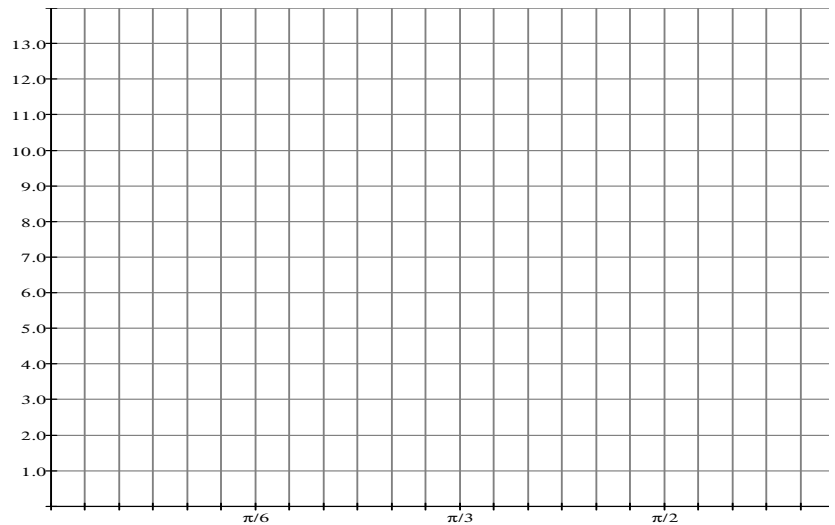| Property	Cosecant $y = \csc x$	Secant $y = \sec x$	Cotangent $y = \cot x$
Domain			
Range			
Period			
Equations of Asymptotes			
Points of intersection with corresponding Primary Trig Functions			

Modelling with Reciprocal Relationships

Example: When the sun is directly overhead, its rays pass through the atmosphere as shown. Call this 1 unit of atmosphere. When the Sun is not overhead, but is inclined at angle x to the surface of the Earth, its rays pass through more air before they reach sea level. Call this y units of atmosphere. The value of y affects the temperature of the Earth.

Atmosphere

x

y

1

Sea Level
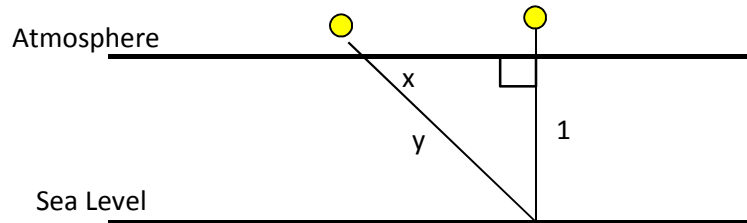
a) Determine an expression for y in terms of angle x.

b) Graph y = f(x) in the interval x∈ [0, π/2].

x	tan x	cot x
0	0	
π / 36	1	
π / 18	undef	
π / 12	-1	
π / 6	0	
π / 4	1	
π / 3	undef	
5π / 12	-1	
π / 2	0	

13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0

π/6   π/3   π/2

c) Describe what happens to the value of y as x approaches 0. Explain this answer in relation to the question.