

Ch. 25 - Board ' Problems

Sketch Graphs then confirm on your calculator.

1. $Y = \csc(2x - \pi)$

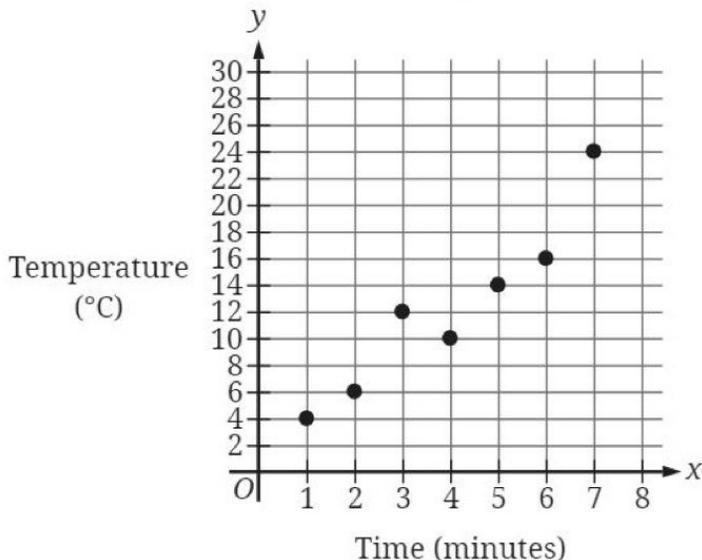
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2. $Y = 3 \cos(2x) - 2$

3. If $f(x) = |x - 4x|$
what value of 'a' satisfies
 $f(5) - f(a) = -15$?

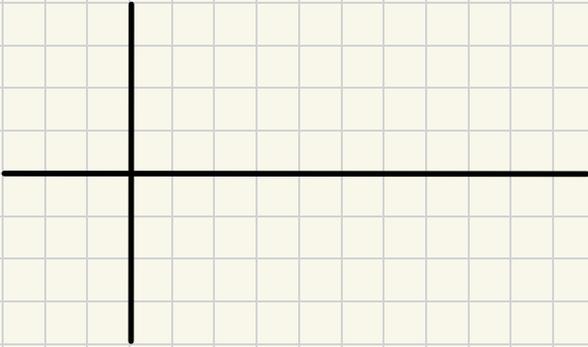
4. what are the zeroes of this equation?
 $y = x^2 - 6x + 8$

During a study, the temperature, in degrees Celsius ($^{\circ}\text{C}$), of the air in a chamber was recorded to the nearest integer at certain times. The scatterplot shows the recorded temperature y , in $^{\circ}\text{C}$, of the air in the chamber x minutes after the start of the study.



What was the average rate of change, in $^{\circ}\text{C}$ per minute, of the recorded temperature of the air in the chamber from $x = 5$ to $x = 7$?

Ch. 25 - GRAPHING TANGENT & COTANGENT



$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

so asymptotes are where $\text{adjacent} = 0$

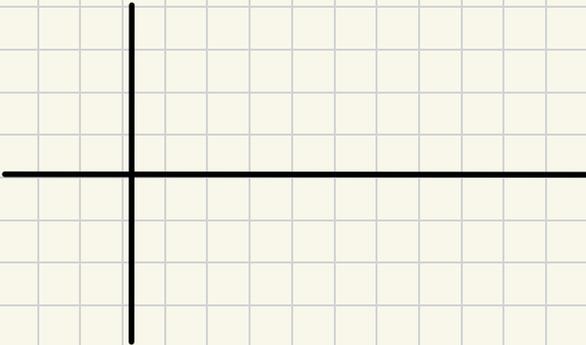
or more generally,

PERIOD: _____

DOMAIN: _____

RANGE: _____

$$y = \cot \theta$$



$$\cot \theta = \frac{\text{adjacent}}{\text{opposite}}$$

so asymptotes are where $\text{opposite} = 0$

or more generally,

PERIOD: _____

DOMAIN: _____

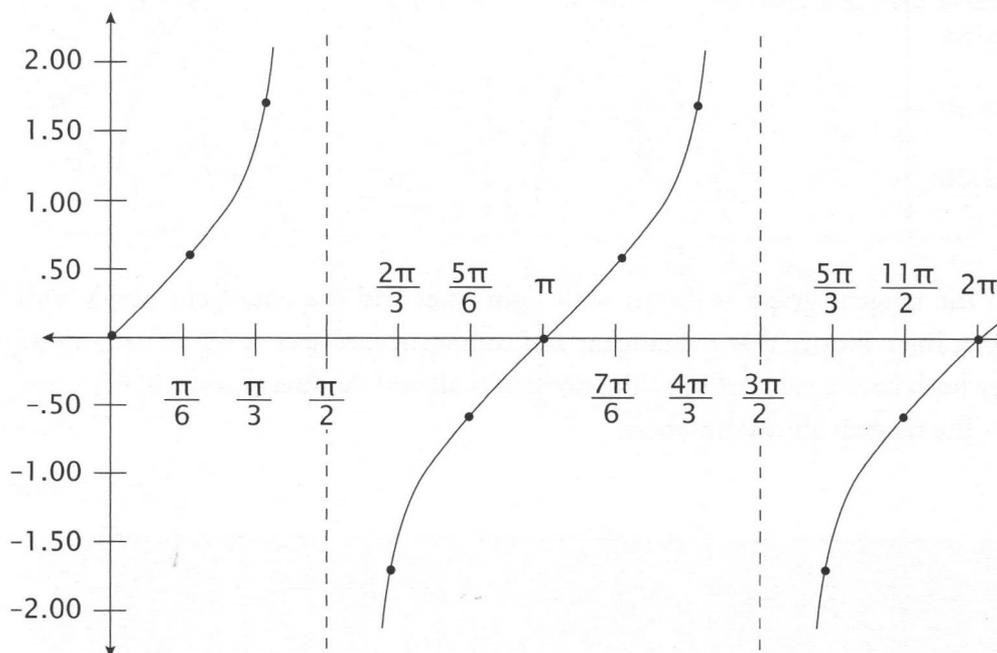
RANGE: _____

LESSON 25

Graphing the Tangent and Cotangent

Since tangent $\theta = \sin \theta / \cos \theta$, we'll put the sine and cosine together. $\cos \theta$ can not be equal to zero since $\tan \theta$ would then be undefined. So, there will be asymptotes when $\cos \theta$ approaches zero.

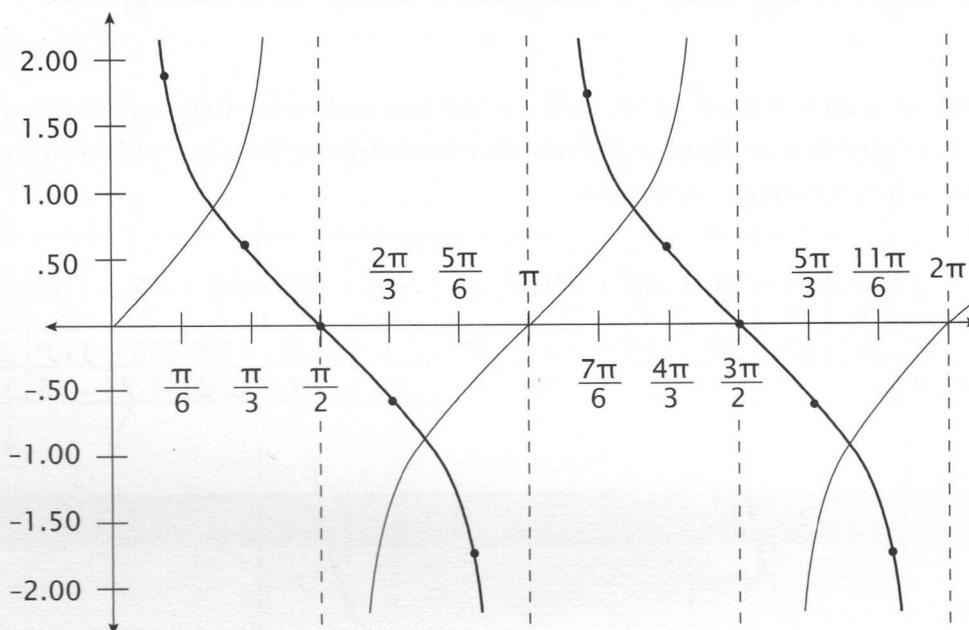
x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
tan x	0	.58	1.7	Und	-1.7	-.58	0	.58	1.7	Und	-1.7	-.58	0



The amplitude is infinite. The domain is all the real numbers except $n\pi + \pi/2$. The range is all the real numbers. Note that the period is π rather than 2π .

To graph the cotangent, consider that it is $1/\tan x$ or $\cos x/\sin x$. Right away we can see that whenever the $\sin x$ is zero, the cotangent will be undefined. Where the function is undefined, we will find our asymptotes. The $\sin x$ is zero at 0° , 180° , and 360° . Let's make a table and observe the data.

x	0	$\frac{\pi}{6}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	π	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	2π
x	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
$\tan x$	0	.58	1.7	Und	-1.7	-.58	0	.58	1.7	Und	-1.7	-.58	0
$\cot x$	Und	1.7	.58	0	-.58	-1.7	Und	1.7	.58	0	-.58	-1.7	Und



The tangent graph is drawn with light lines and the cotangent graph with darker lines. Notice that the tangent and cotangent intersect at 45° or $\pi/4$, where they both have a value of one. The domain is all real numbers except $0, \pi, 2\pi, n\pi$, etc. The range is all real numbers.

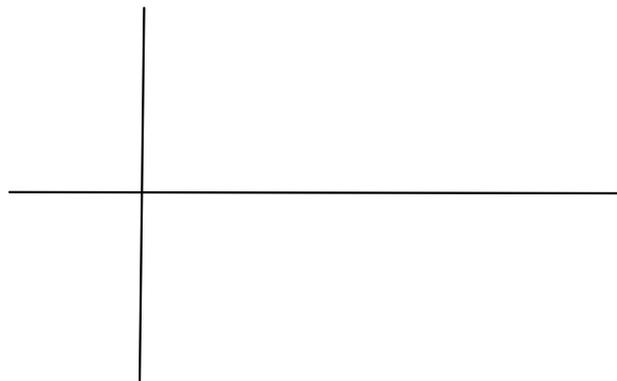
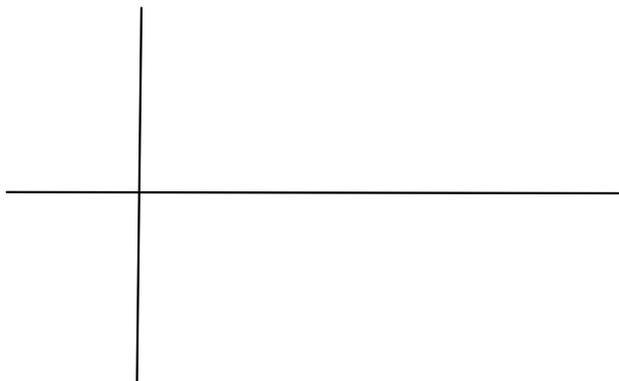
$$y = A \underline{\quad} B(x - S) \pm T$$

Practice Problems 1

Find the shift, period, and translation of each function, and then sketch the graph. (Note that the amplitude affects the shape of the curve, but does not define the upper limits of the graph because the lines continue to infinity.)

1. $y = \cot 2x + 1$

2. $y = 2 \tan(x - \frac{\pi}{2})$



Factors and Zeros

Find all zeros.

1) $f(x) = (2x - 1)(x - 5)$

2) $f(x) = (x - 3)(3x + 1)(x + 1)$

3) $f(x) = (2x + 1)(x + 1)(x - 1)$

4) $f(x) = x(5x - 2)(x^2 + 1)$

5) $f(x) = x(x + 2)(x - 2)(3x^2 - 4)$

6) $f(x) = (2x - 1)(x^2 + 3)(2x^2 - 5)$

7) $f(x) = x(2x - 1)(x - 1)(x + 1)$

8) $f(x) = (2x + 5)(x^2 - 2x - 5)$

Write a polynomial function of least degree with integral coefficients that has the given zeros.

9) 3, 2, -2

10) 3, 1, -2, -4

11) 5, -1, 0

12) $-3, -\frac{1}{3}, 5$

13) $\frac{5}{3}, 1, -1$

14) $2, \frac{5}{3}, -5$

Find all zeros by factoring each function.

15) $f(x) = x^3 - 2x^2 + x$

16) $f(x) = x^3 + 8$

17) $f(x) = x^4 - x^2 - 30$

18) $f(x) = x^4 + x^2 - 12$

19) $f(x) = x^6 - 64$

20) $f(x) = x^6 + 2x^3 + 1$