


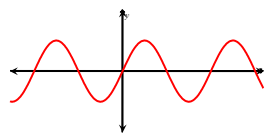
**SECTION 3.3 GRAPHING SINE
COSINE AND TANGENT
FUNCTIONS**

I) WHAT IS A PERIODIC FUNCTION?


- A function that repeats
- The range of input values within a cycle is
- There are many examples of periodic functions in our world
 - Ocean waves and ocean currents
 - Solar system
 - Finance and Market trends
 - Sound waves, light transmission, radiation
 - Wave propagation: earthquakes,
 - Heart beat



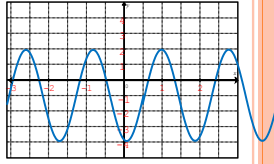
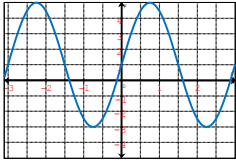
II) COMPONENTS OF A PERIODIC FUNCTION:



Crest:
Trough:
Amplitude:
Period:



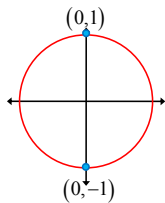
Ex: Given each graph, indicate the period and amplitude



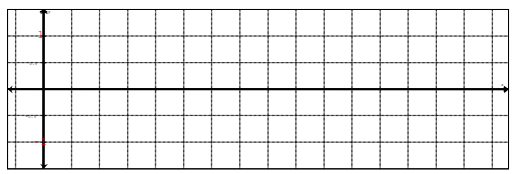
Ex: If high tide occurred at 7:30am and low tide was at 1:30pm, what time will the next high tide be?

III) SINE FUNCTION IN AN UNIT CIRCLES:

- **Sinθ** in an unit circle is equal to
- The highest y-coordinate is at
- The value of **Sinθ** changes
- If we graph the sine function, we are comparing



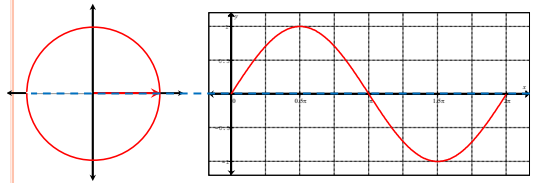
IV) GRAPHING THE SINE FUNCTION:



- X-axis:
- Y-axis:



SINE FUNCTION:



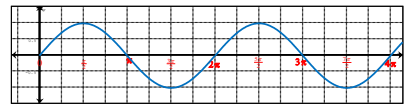
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Ex: Find the following for the sine function:

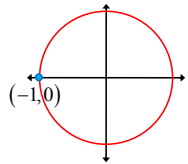
- a) Period & amplitude
- b) Y intercept
- c) X intercept and a general formula
- d) Domain and Range



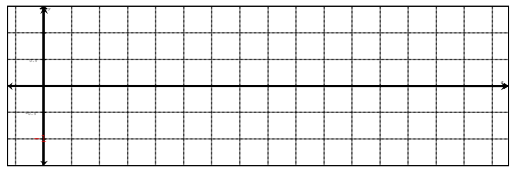
V) COSINE FUNCTION IN AN UNIT CIRCLES:

- o **Cosθ** in an unit circle is equal to
- o The lowest x-coordinate is
- o The value of **Cosθ** changes

- o If we graph the Cosine function, we are comparing

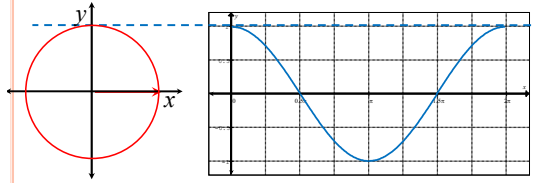


VI) GRAPHING THE COSINE FUNCTION:



- o X-axis: value of the central angle in radians
- o Y-axis: value of cosθ, x-coordinate point "P"
 - Highest (1) and lowest (-1)

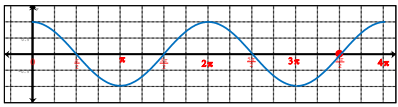
COSINE FUNCTION:



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Ex: Find the following for the cosine function:

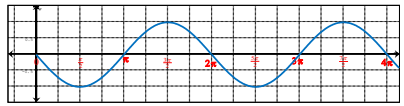
- a) Period & amplitude
- b) Y intercept
- c) X intercept and a general formula
- d) Domain and Range



VII) SUMMARY FOR GRAPHING COSINE/SINE FUNCTIONS

- When graphing a Sine & Cosine function, there are only 5 points to consider: Beginning, Middle, End, Quarter way, and 3 Quarters way of the period
- Sine Function:
 -
 -
 -
- Cosine Function
 -
 -
 -

Ex: What is the equation for the following graph?



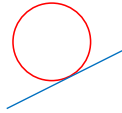
- a) $y = \sin \theta$
- b) $y = \cos \theta$
- c) $y = -\sin \theta$
- d) $y = -\cos \theta$

REVIEW: TANGENT FUNCTION & TANGENT LINES

- SOH-CAH-TOA
- Using the ratio of opposite over adjacent, we can show that the tangent function is

$$\tan \theta = \frac{\text{opp}}{\text{adj}} \quad \tan \theta = \frac{\text{opp}}{\text{adj}}$$

- A tangent line is a line that crosses a circle at only one point



VIII) TANGENT FUNCTIONS AND UNIT CIRCLES

- There are two ways to relate the tangent function with an unit circle

1st Method

- The tangent function can be defined as

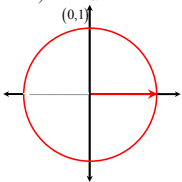


2nd Method

- The tangent function can be defined as

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IX) TANGENT = Y-COORDINATE / X-COORDINATE



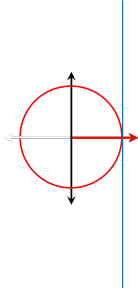
- at $\theta = 0$
- at $\theta = 30^\circ$
- at $\theta = 45^\circ$
- at $\theta = 60^\circ$
- at $\theta = 90^\circ$

-
-

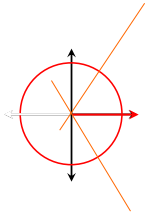
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X) TANGENT AS THE Y-COORDINATE ON THE VERTICAL TANGENT LINE

- The tangent function can be defined as the y-coordinate of the extension of the terminal arm on a vertical tangent line



- As the terminal arm rotates around the circle, it will cross the tangent line above the X-axis (+ve) or below the X-axis (-ve)
- I.e: when the terminal arm is in Q1, it crosses the tangent line above the X-axis, so $\tan\theta$ is positive



XI) TANGENT FUNCTION AS A RECIPROCAL

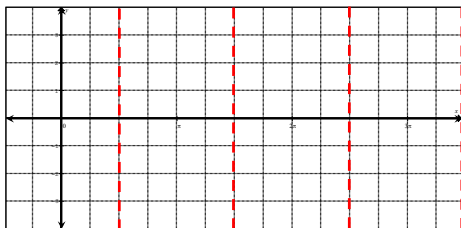
$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

- The Tangent function is
- At points where $\cos\theta = 0$, you will get a
- At points where $\sin\theta = 0$, you will
- At points where $\sin\theta = \cos\theta$, the value of $\tan\theta$ will be

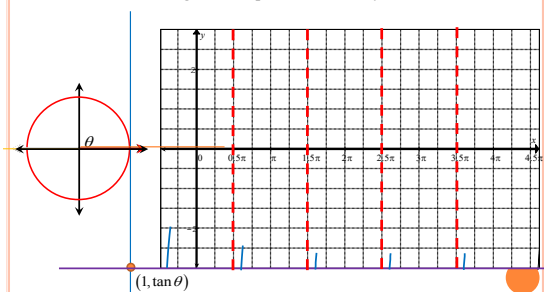


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TANGENT FUNCTION $y = \tan x$



- The tangent function can be defined as the y-coordinate of the extension of the terminal arm on a vertical tangent line
- As the angle changes and increase, the value of $\tan\theta$ will fluctuate from negative to positive infinity

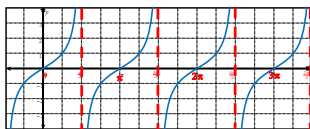


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Ex: Indicate the following for the tangent function: $y = \tan \theta$

- a) Domain & Range
- b) X-intercepts and the general formula
- c) Period and amplitude



XII) VERTICAL ASYMPTOTE AND GENERAL FORMULA:

- Since $\tan\theta = (\sin\theta/\cos\theta)$, the vertical asymptotes will all appear when $\cos\theta=0$ (Denominator is equal to zero)
- The general formula for all the vertical asymptotes in a tangent function will be:

$x =$

("n" is an integer)

$x =$

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Ex: Given that $0 < \theta < 2\pi$, $\tan\theta > 0$ and $\sin\theta < 0$, what quadrant is the angle in?

- a) *Quadrant 1*
- b) *Quadrant 2*
- c) *Quadrant 3*
- d) *Quadrant 4*

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