## Precalculus for Juniors Spring 2019 - Final Exam Topic List

## Unit 5 - Trigonometric Identities

- Factoring, Simplifying
- Simple trig Equations
- Fundamental Identities
- Sum and difference Formulas
- Double angle Formulas
- Trig Equations with multiples of angles
- Trig Equations with non-standard values
- Verifying


## Unit 6 - Laws of Sines and Cosines

- Law of Cosines
- Law of Sines
- Ambiguous Case
- "Sine" Area Formula
- Hero's Formula
- Applications


## Unit 7 - Vectors

- Notations
- Magnitude
- Direction Angle
- Angle In Between
- Dot Product
- Projections
- Applications
- Vector Equations of Lines
- Distance between line and point


## Unit 8 - Sequences and Series

- General Sequences and Series
- Factorials
- Arithmetic Sequences and Series
- Geometric Sequences and Series
- Explicit versus Recursive Formulas
- Finite Geometric Series
- Infinite Geometric Series
- Finite Arithmetic Series
- Summation Notation


## Unit 9 - Probability

- General Probability
- Fundamental Counting Principal
- Geometric Probability
- Permutations
- Combinations
- Compound Probability
- Independent Probability
- Dependent Probability
- Conditional Probability
- Exclusivity
- Two-Way Tables

Unit 10 - Survey of Functions and Logarithms

- See last week's test review


## UNIT 5 - Trigonometric Identities - Due Friday, May 17

Verify the following identities.

1. $\frac{\csc \theta}{\sec \theta}+\frac{\cos \theta}{\sin \theta}=2 \cot \theta$
2. $\frac{\sec ^{2} x-\tan ^{2} x+\tan x}{\sec x}=\cos x+\sin x$
3. $1-\frac{\sin ^{2} \theta}{1-\cos \theta}=-\cos \theta$
4. $\frac{\tan x}{1+\sec x}+\frac{1+\sec x}{\tan x}=2 \cdot \csc x$
5. $\frac{\cos \left(\frac{\pi}{2}-x\right)}{1-\cos x}=\frac{\sec x+1}{\tan x}$
6. $\frac{\cos x}{1+\sin (-x)}=\tan x+\sec x$

Simplify as much as possible.

1. $\cot ^{2} x-\cot ^{2} x \cdot \cos ^{2} x$
2. $\sec ^{3} \theta-\sec ^{2} \theta-\sec \theta+1$
3. $\frac{1}{1+\cos \theta}+\frac{1}{1-\cos \theta}$
4. $\tan x-\frac{\sec ^{2} x}{\tan x}$

Solve each equation on the interval $0 \leq \theta<2 \pi$. All solutions should be standard unit circle angles.

1. $\sqrt{3}=\tan \theta$
2. $\sqrt{2}=\csc \theta$
3. $2 \tan ^{2} \theta=2$
4. $-4 \cos \theta=2 \sqrt{3}$
5. $-1+8 \sin \theta=-4 \sqrt{3}-1$
6. $\sin ^{2} x-\sin x-2=0$
7. $\sec ^{2} x-\sec x-2=0$

## Find the exact value of each expression

1. $\sin 15^{\circ}$
2. $\cos \frac{11 \pi}{12}$
3. $\tan 165^{\circ}$
4. $\csc 75^{\circ}$

Evaluate or Simplify.
5. $\sin 2 x \cos 5 x-\sin 5 x \cos 2 x$
6. $\frac{\tan (x+1)+\tan (x-1)}{1-\tan (x+1) \tan (x-1)}$
7. $\cos 221^{\circ} \cos 79^{\circ}-\sin 221^{\circ} \sin 79^{\circ}$
8. $\frac{\tan 586^{\circ}-\tan 466^{\circ}}{1+\tan 586^{\circ} \tan 466^{\circ}}$

Given $\sin \theta=-\frac{5}{13}$ and $\tan \theta<0$, find the exact value of each equation.
9. $\sin 2 \theta$
10. $\cos 2 \theta$
11. $\sin \left(\frac{\theta}{2}\right)$
12. $\tan 2 \theta$

Evaluate the given expressions using the information provided.
4. $\cos (\alpha-\beta)$
13. $\sin (\beta-\alpha)$
15. $\tan (\alpha+\beta)$

Given $\cos \alpha=-\frac{3}{5}$ where $\alpha$ is in quadrant II,
and $\tan \beta=\frac{8}{15}$ where $\beta$ is in quadrant III.

## Equations

16. $2 \cos (4 x)+1=0$
17. $4 \sin (2 x)-3=0$
18. $\tan \left(\frac{2 x}{3}\right)-1=0$
19. $27-2 \tan x=0$
20. $2 \tan ^{2}(2 x)-6=0$
21. $4 \sin ^{2}\left(\frac{x}{2}\right)-3=0$

## UNIT 6 - Law of Sines and Cosines - Due Thursday, May $16^{\text {th }}$

Solve each problem by answering the question indicated. Round all answers to the nearest tenth.

1. Given $\triangle A B C$ with $a=9, b=8$, and $c=13$, find $\measuredangle C$.
2. Given $\triangle A B C$ with $\measuredangle A=25^{\circ}, \measuredangle B=75^{\circ}$, and $c=12$, find $b$.
3. Given $\triangle A B C$ with $\measuredangle A=62^{\circ}, \measuredangle C=49^{\circ}$, and $a=14$, find $c$.
4. Solve $\triangle A B C$ if $\measuredangle B=65^{\circ}, a=10$, and $b=8$.
5. Solve $\triangle A B C$ if $\measuredangle C=40^{\circ}, a=7$, and $c=5$.
6. Find the area of $\triangle A B C$ if $\measuredangle A=103^{\circ}, b=15$, and $c=17$.
7. An Atlanta park is made from an area between three intersecting streets (as shown). IF the lengths of the sides of the park are 675 feet, 525 feet, and 935 feet, what is the area that the park takes up?

8. A flagpole was incorrectly mounted in the ground 100 feet in front of a building without using cement. It now leans at an angle $5^{\circ}$ from vertical away from the building. If a person standing at the front door looks at the top of the flagpole at an angle of elevation of $38^{\circ}$, how tall is the flagpole?
9. A sign is posted on the side of a hill that makes a $12^{\circ}$ angle with the horizontal. The sun is shining at an angle of
elevation of $62^{\circ}$ making a shadow down the hill. If the sign is 8 feet tall, how long is its shadow?
10. A plane leaves an airport heading due south. After 100 miles, the captain turns to the right at an angle of 35 degrees. 200 miles later the plane reaches its destination. How far is the plane from its original location?

## UNIT 7 - Vectors - Due Thursday, May $16^{\text {th }}$

1. Write the component form of the vector $\overline{P Q}$ where $P=(-5,-8)$ and $Q=(12,9)$ ?
2. Write $\overline{P Q}$ in both trigonometric form and as a linear combination.
3. Write the component form of the vector $\overline{P Q}$ where $P=(-3,5,11)$ and $Q=(7,9,22)$ ?

| Use vectors $\mathbf{u}=\langle 5,12\rangle, \mathbf{v}=\langle-3,8\rangle, \mathbf{w}=\langle 5,4\rangle, \mathbf{f}=\langle-2,-5\rangle, \mathbf{d}=\langle 4,-7\rangle$ to answer \#4-11 |
| :--- |
| $4 . \mathbf{v + w}$ |
| 5. $(\mathbf{u} \cdot \mathbf{v}) \mathbf{w}$ |

8. The unit vector in the same direction as $\mathbf{v}$.
9. $\mathrm{f} \cdot \mathrm{d}$
10. The direction angle for $f$.
11.The angle between $\boldsymbol{f}$ and $\mathbf{d}$.

Use vectors $\mathbf{a}=\langle 5,2,8\rangle, \mathbf{b}=\langle-1,1,-3\rangle, \mathbf{c}=\langle 11,-8,14\rangle$ to answer \#12-15.
12. $\mathbf{a}+\mathbf{b}+\mathbf{c}$
13. ||b||
14. $a \cdot b$
15. The angle between $\mathbf{a}$ and $\mathbf{c}$.
16. Define: orthogonal
17. The component form of the vector for a missile launched at $62^{\circ}$ with a velocity of 578 mph is $\qquad$ .
18. A wagon weighing 700 pounds is being pulled up a hill that makes a $14^{\circ}$ slope by a group of people. What is the minimum combined force required to move the wagon?
19. A jet is flying on a bearing of $\mathrm{N} 35^{\circ} \mathrm{E}$ at 410 mph . A cross wind of 75 mph is blowing on a bearing of $\mathrm{N} 80^{\circ}$ W. What is the actual speed of the plane? What is the actual bearing of the jet?
20. Two dogs are pulling on a sled at forces of 25 lbs and 30 lbs respectively. If the resulting force is 54.53 lbs , what is the angle between them?
21. A force of 75 pounds makes an angle of $35^{\circ} 45^{\prime}$ with a second force. If the resultant force makes an angle of $14^{\circ}$ with the first force, what is the magnitude of the second force?
22. A small car is being pushed up a hill that makes a $10^{\circ}$ slope by a group of people. If the minimum combined force required to move the car is 304 lbs , what is the weight of the car?
23. Write a vector equation of the line through $(7,-3)$ and $(-2,9)$.
24. Write a vector equation of the line parallel to $<6,2>$ through $(4,-1)$.
25. Locate the point $80 \%$ of the way from $(1,7)$ to $(5,3)$. (Use vectors...)

