**Accelerated Precalculus *(Poss)* Spring Final Exam Topic List**

**Unit 1 – Laws of Sines and Cosines**

* Law of Cosines
* Law of Sines
* Ambiguous Case
* “Sine” Area Formula
* Hero’s Formula
* Applications

**Unit 2 – 2-D Vectors**

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

**Unit 3 – Parametric Equations**

* Parameter (time)
* Parametric Forms of Functions
* Graphing Parametrics
* Projectiles
* Applications

**Unit 4 – Polar Equations**

* Notation
* Plotting (Points)
* Graphing Equations
* Types of Polar Curves
* Converting Equations
* Polar Form of Conics
* Intersections of Polar Curves
* Complex Numbers
* Powers and Roots

**Unit 5 – Sequences and Series**

* Arithmetic Sequences and Series
* Geometric Sequences and Series
* Factorials
* Polynomial Sequences
* Complex Numbers
* Induction Proofs
* Harmonic, Fibonacci Sequences

**Unit 6 – 3D Vectors**

* Extensions of 2D
* Geometry of Space – lines, planes, spheres
* Distance Between Pt/Plane, Pt/Line, 2 Lines
* Equations of ǁ and ⊥ Planes and Lines
* Intersections of Plane/Plane, Plane/Line, Sphere/Line

**UNIT 1 – Law of Sines and Cosines**

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

1. Given  with , , and ,

 find .

2. Given  with , , and

 , find .

3. Given  with , , and

 , find .

4. Solve  if , , and .

5. Solve  if , , and .

6. Find the ***area*** of  if , , and .

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 5o 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 38o, how tall is the flagpole?

9. A sign is posted on the side of a hill that makes a 12o angle with the horizontal. The sun is shining at an angle of

 elevation of 62o 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 2 – 2-D Vectors**

1. Write the component form of the vector  where  and ?

2. Write  in both trigonometric form and as a linear combination.

Use vectors **u = , v = , w = , f = , d = ** to answer #4-11

3. **v + w** 4. **(uv)w** 5. ||**u**|| 6. 3**f** – 2**d**

7. The unit vector in the same direction as **v**. 8. The direction angle for **f**.

9. **fd** 10.The angle between **f** and **d**.

11. Define: *orthogonal*

12. The component form of the vector for a missile launched at  with a velocity of 578 mph is \_\_\_\_.

13. A wagon weighing 700 pounds is being pulled up a hill that makes a slope by a group of people. What is the minimum combined force required to move the wagon?

14. A jet is flying on a bearing of NE at 410 mph. A cross wind of 75 mph is blowing on a bearing of NW. What is the actual speed of the plane? What is the actual bearing of the jet?

15. 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?

16. A force of 75 pounds makes an angle of  with a *second* force. If the *resultant* force makes an angle of  with the first force, what is the magnitude of the *second* force?

17. A small car is being pushed up a hill that makes a 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?

18. Write a vector equation of the line through (7, -3) and (−2, 9).

19. Write a vector equation of the line parallel to <6, 2> through (4, −1).

20. Locate the point 80% of the way from (1, 7) to (5, 3). (Use vectors…)

**UNIT 3 – Parametric Equations**

***Graph each parametric set.***

1.  2. 

***Obtain the rectangular equation from the given set of parametric equations by eliminating the parameter t.***

3.  4. 

5.  6. 

7.  8. 

9.  10. 

11. Charlotte and Madison are on a Ferris wheel of radius 35 feet that turns counterclockwise at the rate of one revolution every 12 seconds. The lowest point of the Ferris wheel (6 o’clock) is 15 feet above ground level at the point (0, 15) on a rectangular coordinate system. Find a set of parametric equations for your position as a function of time t (in seconds) if you are at the lowest point when the Ferris wheel starts turning.

12. Adam throws a ball straight up with an initial speed of 50 ft/sec from a height of 6 feet.

* Find the set of parametric equations that describe the motion of the ball as a function of time.
* How long is the ball in the air?
* When is the ball at its maximum height?
* What is the maximum height of the ball?
* Write the rectangular equation that models the path of the ball as a function of the horizontal distance (x).

**UNIT 4 – Polar Coordinates**

***Plot and label each point on the Polar Grid to the right.***

1. A (3, 135o)

2. B (-2, π/2)

3. C (5, - 5π/12)

4. Find three other coordinates that give the same location as (5, π/3).

***Convert each point to Rectangular Form. Convert each point to Polar Form.***

5. (6, 78o) 6. (-12, 2π/3) 7. (7, -8) 8. (5, 12)

***Write each equation in a Standard Rectangular Form.***

9.  10.  11.  12. 

***Write each equation in polar form.***

13.  14.  15.  16. 

***Write the polar equation for the conic section with the given characteristics.***

17. e = 3, directrix: x = 4 18. e = 1.5, vertices at (-3, 0) and (-15, 0)

***Determine the eccentricity and type of conic section for each polar equation.***

19.  20. 

***Find the points of intersection for each set of polar equations.***

21.  and  22.  and 

***Write each polar equation as a set of parametric equations.***

23.  24. 

***Determine the type of special polar curve below (by name and characteristic if applicable).***

25.  26.  27. 

28.  29.  30. 

31.  32.  33. 

**UNIT 5 – Sequences and Series**

1. Find an explicit rule for the nth term 2. Find the nth term of an arithmetic sequence with

 22, 19, 16, 13, 10, 7, … a5 = 22 and a14 = 94

3. Find the sum: -3 + -1 + 1 + 3 + … + 39 + 41 4. 

5. Find an explicit rule for the nth term 6. Find the nth term of a geometric sequence with

3, -6, 12, -24, 48, -96, … a6 = 486 and a10 = 39366

7. Find the sum: 1 + 3 + 9 + 27 + … + 19683 8. 

9. Find the sum: 180 + 90 + 45 + … + 1.40625 10. 

11. Find the nth term of the sequence: 6, 6, 12, 36, 144, 720, …

12. Find the nth term of the sequence: -2, -4, -4, -2, 2, 8, 16, …

13. Find the nth term of the sequence: -16, 9, 4/3, 1/5, 0, 1/9, 4/11, …

14.  15. 

16.  = 17. 

18. Simplify (leave in factored form): 

19. Prove: 

**UNIT 6 – 3-D Vectors, etc.**

If M = (2, 7, -5), N = (7, -3, 0), P = (-2, 3, 3) and O is the origin:

1. Find $\left|\vec{MN}\right|$. 2. Find m∠MPN.

2. Write the equation of the plane through 4. Find the area of ΔMNP.

 M. N and P.

5. Find the intersection of line $\overleftrightarrow{MP}$ 6. Find the distance between P and the plane

 and the plane 8x – 4y + z = 5. 8x – 4y + z = 5.

7. Find the distance between P and $\overleftrightarrow{MN}$. 8. Find the distance between $\overleftrightarrow{PO}$ and $\overleftrightarrow{MN}$.

9. Write the equation of the line perpendicular 10. Find the coordinates of Q if $\vec{PQ}$ = 1/3($\vec{MN}$).

 to 4x + 7y – 3z = 9 that contains P.

11. Write the intersection of 2x – y + 2z = 9 12. Write the equation of the sphere with center M

 and 8x – 4y + z = 5. If the sphere is tangent to 2x – y + 2z = 9.