

EVHS Algebra 2 Unit 6 Test (Part 2) A

You may use a calculator.

You have a class period to finish the portion of the test.

Total possible points = 100 points      100 points = 100%

Here are the basic features for different kinds of conic sections, you will use them in this part of the test:

(a) circle: radius, center

(b) ellipse: center, vertices, co-vertices, foci, major axis, minor axis.

(c) parabola: vertex, focus, directrix, a.o.s, opening, x-intercepts and y-intercepts.

(d) hyperbola: vertices, foci, transverse axis, equations of the asymptotes

1. Joanna is entering a contest to design a logo for her high school football team. Her basic idea is to use an ellipse to outline the logo and find an hyperbola that would intersect the ellipse. As she started her design, she decided that the foci of the ellipse to be at (6, 2) and (-2, 2) and the distance between the vertices of the ellipse is 12. Also the hyperbola in her design has the same foci as the ellipse with the distances between the vertices of the hyperbola to be 6.

(a) (14 points) Graph and identify the basic features of the ellipse in her design.

(b) (10 points) Graph and identify the basic features of the hyperbola in her design.

[Please overlay the graphs in question (a) and (b) ]

(c) (8 points) Write the equations of the ellipse and the hyperbola in Joanna's design.

(d) (16 points) Use the equations you found from (c) to find the intersections of the ellipse and the hyperbola. ( Do not write the answers in decimals. You do not need to rationalize your answer either. Ex:

leave  $\sqrt{\frac{21}{167}}$  , you do not have to rationalize it to  $\frac{\sqrt{3507}}{167}$  )

(e) (8 points) There are 4 intersections in question (d); One intersection in each quadrant. Now, let A, B, C, D be the names of the intersections for each quadrant. Show that quadrilateral ABCD is a rectangle.

(f) (8 points) Write the equations of the diagonals of ABCD.

(g)(8 points) Prove algebraically that the intersection of the diagonals is the center of the ellipse.

(h)(8 points) Rectangle ABCD is circumscribed by a circle. Write the equation of the circumscribing circle.

2. (20 points: G: 1 point, R: 1 point, A: 5 point, S: 7 points, P: 6 points) GRASP approach required.

In music, the governing equation of the frequencies between two notes can be modeled as follow:

$$\log_{\sqrt[12]{2}} \left( \frac{f_n}{f_0} \right) = n \text{ Where } n \text{ is the steps between a note and a reference note.}$$

$f_n$  is the frequency of a note n step away from the reference note and  $f_0$  is the frequency of the reference note. Also open A string of a violin is 440 Hz. Now Hannah was practicing her violin. When she was playing the key C# (+4 steps from Key A) on the A string, Mr. Chen used a spectrum analyzer to find out the frequency she played and realized that the C# she played was at 562 Hz. Mr. Chen believed that Hannah was off pitch, and would like to instruct her to correct her pitch by moving her finger on the finger board. If you were Mr. Chen, how would you instruct Hannah to move her finger? (Hint: Moving the finger toward her will elevate the pitch while moving it away from her to lower the pitch)