EVHS Algebra II Final Tasks

Thanks for being my student this year, I hope the math skills and experiences you have this year goes a long way as your academic journey continues….

There are just a few more reminders before you start your responses:

1. When you construct your responses, please identify which Task you are referring.

Example:

Uvas Canyon County Park Task 1 (1)

The Pluto's Restaurant (2)

2. Please make sure your responses are clear.

3. You may use a mighty calculator to aide your calculating tasks, if you so wish.

4. For conic sections, here are the standard forms for 4 different conic sections

Circle	$(x-h)^2 + (y-k)^2 = r^2$	
Ellipse	$\dfrac{(x-h)^2}{a^2} + \dfrac{(y-k)^2}{b^2} = 1$	$\dfrac{(x-h)^2}{b^2} + \dfrac{(y-k)^2}{a^2} = 1$
Parabola	$4c(x-h) = (y-k)^2$	$4c(y-k) = (x-h)^2$
Hyperbola	$\dfrac{(x-h)^2}{a^2} - \dfrac{(y-k)^2}{b^2} = 1$	$-\dfrac{(x-h)^2}{b^2} + \dfrac{(y-k)^2}{a^2} = 1$

Alright, that's it!

Now you may sit back, relax, enjoy the last 2 hours of Algebra II ☺

oh, ummm.. Good Luck! (That's important!)

Version A

Uvas Canyon County Park

is a county park at the border of San Jose and Morgan Hill.

The Gonzales is planning to go to the Uvas Canyon County Park for camping as the family reunion at the beginning of this summer for 3 nights. Johnny Gonzales who attends EVHS is the family recreation planner this year for the whole family. According to a preliminary survey, there are going to be 18 adults and 29 minors to join the event. Moreover, they prepare to carpool and take 11 vehicles to the site. As a recreation planner, Johnny is responsible for several tasks:

Task 1: Decide the Costs for the Tent

Since Gonzales is a big family, they would like to know how much they are going to spend over the reunion. Here is some fees that Johnny researches ahead of the time,

Tent:

Tent types	Adults	Minors	Reservation fee	Cost per night
Standard	2	3	$5	$50
Igloo	1	2	$7	$20

Campground:

reservation fee	use (per car per night)	special maintenance fee (per site per night)
$8	$24	$2

(1) Let $P_s(x)$ represent the cost of renting a standard tent for x nights. Find $P_s(x)$

(2) Let $P_g(x)$ represent the cost of renting an igloo tent for x nights. Find $P_g(x)$

(3) How many Standard and Igloo tents Johnny needs to reserve ahead of the time?

(4) What is the cost of the tent renting, based on the result from question (3)?

Task 2: Finding the Ideal Camping Sites

A map was given to Johnny as he plans to reserve the camp sites. The guidelines given by the reunion committee is: the site need to be equidistant to all restrooms and the "upper bench youth camp center"
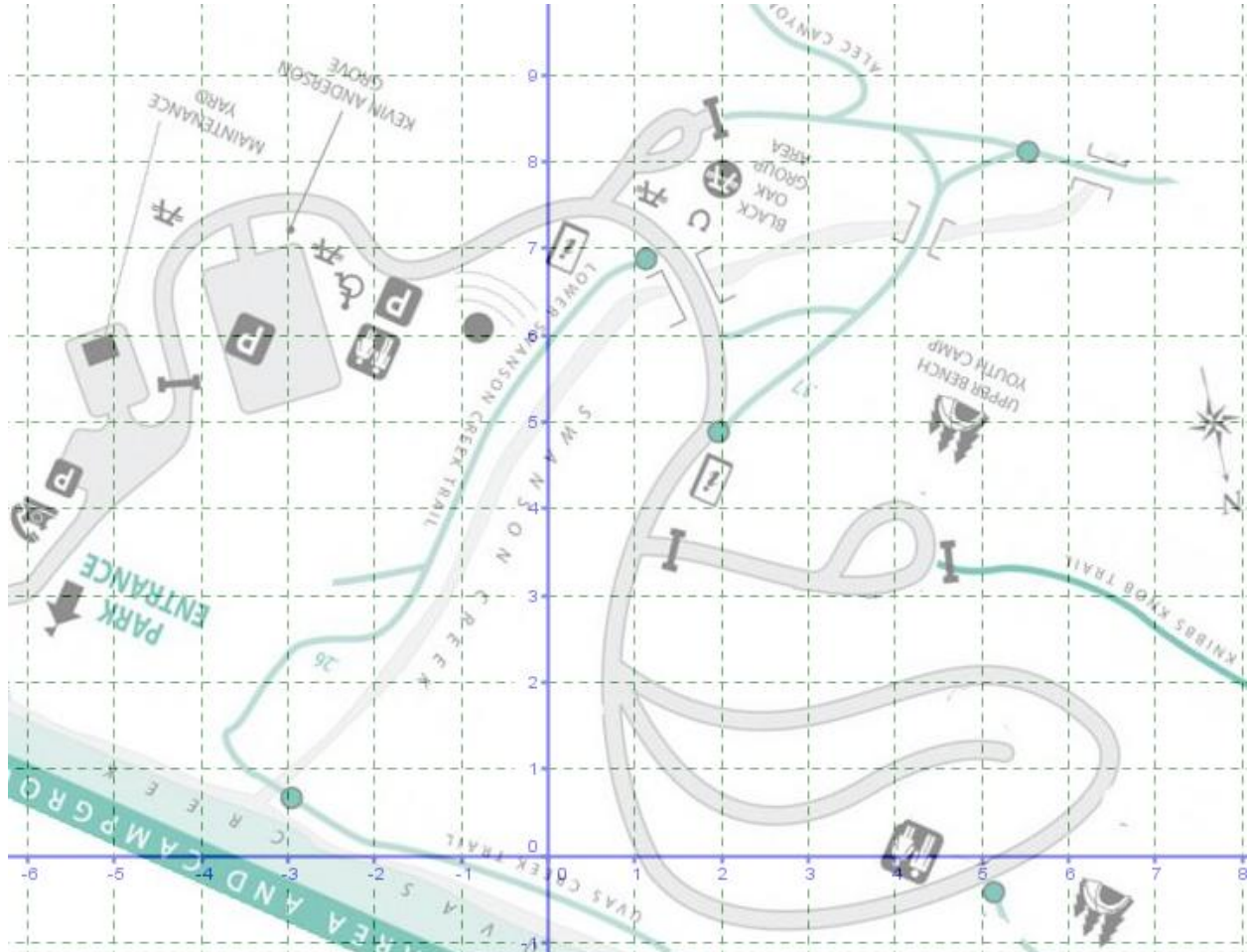
(5) Find the coordinates of the restrooms?(Assume the nearest integer coordinates)

(6) Let two restrooms on the map to be point A and point B. The upper bench youth camp to be point C(5, 5). Find the equations of the perpendicular bisectors of $\overline{AC}$ and of $\overline{BC}$?

(7) Find the intersection (E) point of the equations in question (6).

(8) Write a system of inequalities such that the solution of the system to represent $\triangle ABC$ and its interior.

Beach Ball

A beach ball is thrown into the air and then begins bouncing up and down on the floor at a gym. As the ball is bouncing, it is also advancing away from the point from where it was thrown. Now the following table records the first 4 highest points the ball reached. (Even though this is not reasonable, in order to simplify the reasoning process, ignore the size of the beach ball from this point on.)

height of the ball when it is at the highest point (feet) [The exact decimal of the height may be round off at the hundredth place]	12	9	6.75	5.06
horizontal distance from the point the ball was thrown when it is at its highest point(meters)	2	6	10	14

(1) On a graph, plot each highest point where the beach ball reached. Use the horizontal distance from the point where the ball was thrown as the x-axis and the height of the ball where it was at the highest point as the y-axis to construct the coordinate plane.

(2) Based on the first 4 records given, construct a conjecture statement for how the height of the beach ball will be when it reaches its successive highest points

(3) Based on the first 4 records given, construct a conjecture statement for how the horizontal distance of the beach ball from the point it was thrown will advance when it reaches its successive highest points.

 (4) Assume that every bounce is a parabola. At the end of the gym there is an array of lockers which is 4 feet tall from ground up. If the horizontal distance from the point where the ball was thrown until it reaches the end of the room is 17 meters and the ball does not change its bouncing pattern until it hits the wall at the end of the room, will the ball hit any of the lockers? Use the trajectory of the ball to justify your answer.

Play with Functions

Task 1

Let $f(x) = 2x - 3$, $g(x) = x$, $h(x) = \sqrt{x+2}$,

(1) graph $p(x) = f \circ h(x)$, also identify the domain and range of p(x)

(2) solve algebraically the intersection of $p(x)$ and $g(x)$

(3)Find $m^{-1}(x)$ if $m(x) = h \circ (\dfrac{f}{g})(x)$

(4) Evaluate $m^{-1}(1) \cdot m(1)$

Task 2

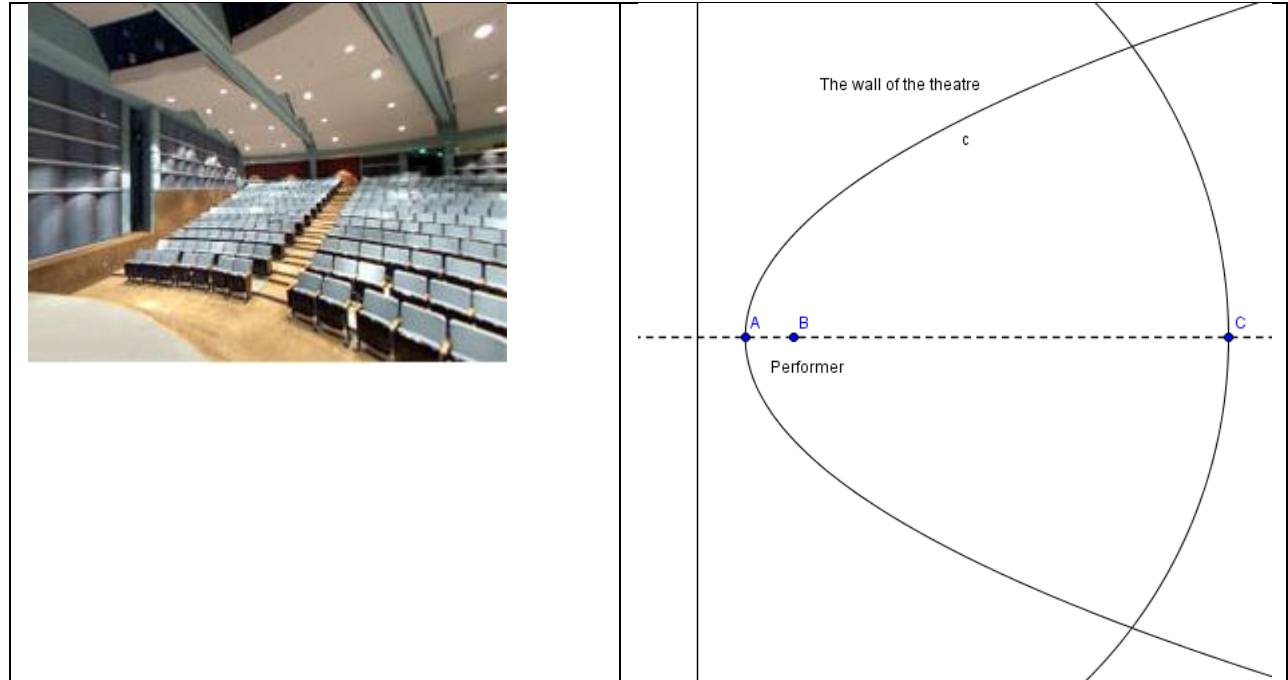If the degree of polynomial $f(x)$ is 3 and all coefficients of $f(x)$ are rational numbers.

(5)Find $f(x)$, (please express $f(x)$ in the form of $f(x) = ax^3 + bx^2 + cx + d$)and

(6) Find the remainder of $f(x) \div (x+2)$

if y-intercept of $f(x)$ is (0, 15) and some of zeros of $f(x)$ are $3, -2 + i$ (where $i = \sqrt{-1}$)

At Santa Clara Convention Center

You will find a theatre with the shape of a parabola.

The wall of the theatre

c

A   B

Performer

|C

Point A(2, 2) is the vertex of the parabola. Directrix of the parabola located at $x = \dfrac{7}{4}$ is the partition of the theatre. A guitarist is going to perform at the focus of the parabola so that her voice can reach the audience with same intensity. (all coordinates measurement is in meters)

(1) What is equation of the parabola?

Now, the end of theatre is a part of a circle centered at A with radius of $\dfrac{3\sqrt{7}}{2}$ meters.

(2) What is the equation of the circle?

(3) Find the intersections between the parabolic and circular walls.

The Sound Sensitivity Level, Decibel. (dB)

The guitarist at the stage is playing a classical piece while a microphone is hanging right above him to record what he plays. In order to make the recording successful, a soundman has to choose an adequate microphone and how far above the player to locate the microphone. Here are some physical facts about sounds.

Sound is measured by the pressure produced from the source. However, when sound travels in air, it loses its power as it propagates away from its source. The relationship of how sound dissipate in air is called the energy dissipation formula, which is proportional to the inverse square of distance between two points.

$$\frac{E_2}{E_1} = \frac{k}{r^2} \text{ (Energy dissipation formula)}$$

Where E_1, E_2 are sound pressures (measured in μPa) of the same sound wave measured at two different locations. The distance between the measurements is r meters. k is a calibration constant.

On the other hand, acoustic sensitivity level is measured in decibel (dB), which is a logarithmic scale, defined below

$$sensitivity(dB) = 20\log\frac{E}{E_{ref}} ,$$

Where E_{ref} is the reference sound pressure = 20 μPa . E is the sound pressure to compare.

A microphone is rated by its sensitivity. If a microphone's sensitivity is -10 dB, this means when a sound pressure is less than -10 dB (when compare with the reference sound pressure), it cannot be recorded. Even though sound pressure is usually measured in μPa , it can be expressed in terms of sensitivity (dB) as well. Usually, dB is what you hear when people talk about how loud a sound is. For example, instead of saying the sound produces a pressure of 2×10^6 μPa , people in the sound industry will say the loudness of the sound is 100 dB.

Today, your task is to adjust the location of your microphone in the theatre to make recording successful.

(4) To start your task, you need to calibrate the energy dissipation formula. First, you ask the guitarist stand at point B and talk at the normal voice and measure the intensity level at sound panel which is at point C in the theatre. You measured -45 dB at point C(Normal conversation = 60 dB) What is k for the recording day?

(5) From the ceiling to the floor of the theatre is 10 m. During a concert a guitar produces sound pressure at 30 dB. At least how far down (from the ceiling) should the microphone be if your microphone's sensitivity is -80 dB? (round to the hundredth)

The Pluto's Restaurant

at the Santana Row (San Jose) offers fresh salads and other dishes. When a customer orders a salad, s/he goes through the following steps: (Copied from the store menu)

Step 1: Choose Your Lettuce (Choose only ONE)

Farmer's Greens	Romaine	Baby Spinach

Step 2: Choose Your Size (Choose only ONE)

Side Salad	Main Salad

Step 3: Choose Your Seven (7) Salad Fixings

Raw Fixings(10 options)	Cooked Fixings(8 options)	Other Fixings(7 options)
Broccoli	grilled fennel	Sunflower Seeds
Cucumbers	sweet walnuts	Dried Cranberry
Red Onions	Green Beans	Pine nuts
Beets	Sweet corn	Crunchy Croutons
Jicama	Garbanzo Beans	Parmesan Cheese
Peas	Sautéed Mushrooms	California Raisins
Carrots	Caramelized Balsamic Onions	Crumbled Blue Cheese
Granny Smith Apples	Roasted Red Bell Peppers	
Plum Tomatoes		
Navel Oranges		

Step 4: Choose A Fresh Baked Bread(Choose only ONE)

Sourdough	Wheat	Foccacia

Step 5: (Optional) Add Meat or Vegetarian Option (Add only ONE)

Grilled Herbed Chicken Breast	Herb Roasted Sonoma Turkey	Grilled Certified Angus Beef
Aidells Poultry Sausage	Crispy Chicken Asteroids	Grilled Portobello Mushroom

Step 6: (Optional) Dress Your Salad with One of Our Homemade Dressings (Choose only ONE)

Balsamic Vinaigrette	Cilantro Lime Vinaigrette	Gorgonzola Vinaigrrete
Caesar Dressing	L.F. Yogurt Based Honey Mustard	House Special Dressing

The Questions

Fiona and her husband, Sal, went to the restaurant to celebrate their 8th anniversary last weekend. Use the setting to answer the following questions.

(1). Fiona loves to have beets, cranberries and garbanzo beans whenever she fixes up her salad. At step #3 (In step 3 only) , if she decided to have the rest of her fixings from the Cooked Fixings category, what is the probability she got sweet walnut or green beans in her fixings?

[Hint: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$]

(2). In step 4, any customer needs to pick a bread to make a salad dish. According to the past experience, the odds for Sal to pick sourdough bread are 5 to 2. Also, whenever Sal picked sourdough bread, the odds for him to pick Balsamic Vinaigrette as dressing for the salad is 2 to 3. However, if he does not pick sourdough bread, the odds for him to pick Balsamic Vinaigrette as dressing becomes 6 to 4. Knowing Sal's ordering history, what is the likely-hood that Sal will pick Balsamic Vinaigrette as dressing today?