Reminders: Answers written using anything other than black or blue ballpen may not be corrected. Items with insufficient or disorganized solutions may not gain full points. Any form of cheating or academic dishonesty is subject to disciplinary action. Box your final answers.

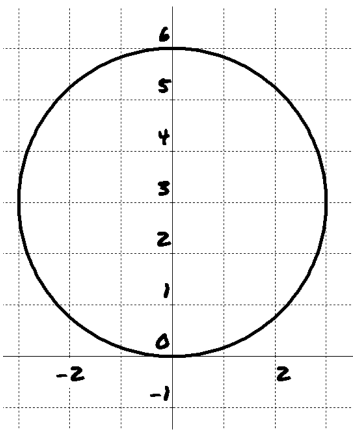
I. Consider the curve $C : x^2 = 8(y+2)$.

1. What type of conic is C? Identify its eccentricity.
2. Find the vertex and focus of C.
3. Find the equation for the directrix and axis of symmetry of C.
4. Find a polar equation representing C. Use the form $r = \frac{ed}{1 \pm \cos\theta}$ or $r = \frac{ed}{1 \pm \sin\theta}$.

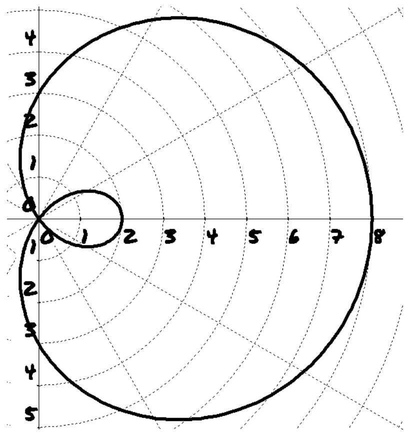
II. Consider the hyperbola whose foci are on $(-2,-4)$ and $(-2,6)$ and whose vertices are on $(-2,-2)$ and $(-2,4)$.

1. Find a Cartesian equation for the hyperbola.
2. Find an equation for each of the two asymptotes of the hyperbola.

III. Aaron and Bon drew the most complicated curve they know.



Aaron's curve



Bon's curve

1. Find a Cartesian equation for Aaron's curve.
2. Find a set of parametric equations for Aaron's curve.
3. Find a polar equation for Aaron's curve.
4. Find a polar equation for Bon's curve.

IV. Let C be the curve represented by the set of parametric equations

$$\begin{cases} x &= \dfrac{t^2}{2} + t + \dfrac{1}{2} \\ \\ y &= \dfrac{4}{3}(t+2)^{3/2} \end{cases}.$$

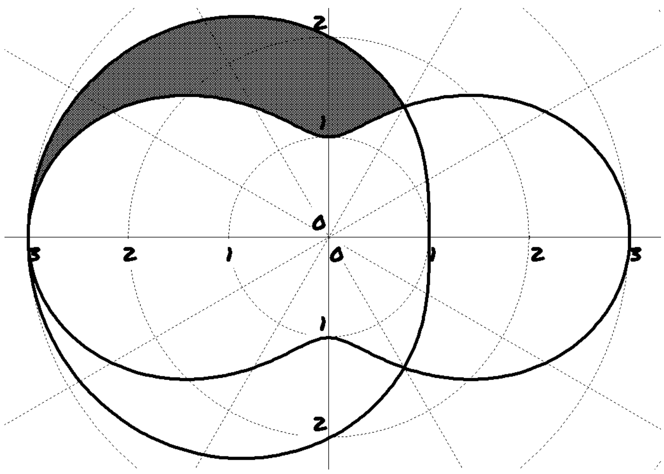
1. Find the **arclength** of C from $t = -1$ to $t = 2$.
2. Find a **Cartestion equation** for the line tangent to C when $t = 7$.

V. Let $C_1 : r = 2\cos^2\theta + 1$ and $C_2 : r = 2 - \cos\theta$.

1. **SETUP** a definite integral to solve for the **perimeter** of C_1. Do not simplify.
2. Find a **Cartesian equation** of the line tangent to C_2 when $\theta = \pi/2$.

VI. The graphs of the curves $C_1 : r = 2\cos^2\theta + 1$ and $C_2 : r = 2 - \cos\theta$ appear below.

1. Find the **points of intersection** of C_1 and C_2. Express in polar coordinates. (Hint: Use quadratic formula for when $n = 1$.)
2. **SETUP** a definite integral to solve for the area of the shaded region. Do not simplify.



END OF EXAM.

"Around the world, around the world." –Daft Punk