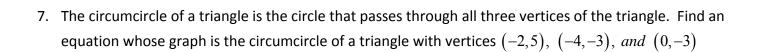
Math club Problem Set #3 Conics:

1. Find the centre and radius of the circle: $4x^2 + 4y^2 + 12x + 16y + 9 = 0$

- 2. A chord of a circle is a line segment whose endpoints are on the circle. Find the length of the common chord of the two circles whose equations are $x^2 + y^2 = 4$ and $x^2 + y^2 6x + 2 = 0$
- 3. Find the area enclosed in the graph of $x^2 + y^2 = 16x + 32y$
- 4. Find "r' if "r" is positive and the line whose equation is x + y = r is tangent to the circle whose equation is $x^2 + y^2 = r$ [AHSME]
- 5. An airline charges \$200 per ticket and sells 40,000 tickets. For every \$10 increase they sell 1000 fewer tickets. How much should they charge to maximize their revenue?

6. Find the smallest possible value of the length of a diagonal of a rectangle with perimeter 36. Prove that your answer is the shortest possible diagonal. Do not just provide an answer:

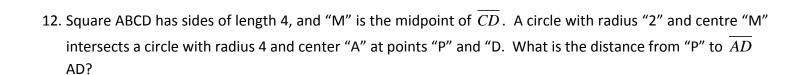


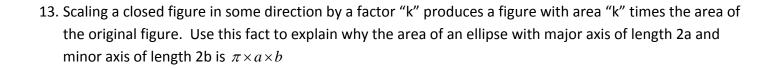
8. Points "A" and "B" are on the parabola
$$y = 4x^2 + 7x - 1$$
, and the origin is the midpoint of \overline{AB} . What is the length of \overline{AB} ?

9. Let
$$f(x) = x^2 + 6x + 1$$
, and let "R" denote the set of points (x,y) in the coordinate plane such that $f(x) + f(y) \le 0$ and $f(x) - f(y) \le 0$. Find the area of "R" [AMC]

10. Find the largest value of "x" for which
$$x^2 + y^2 = x + y$$
 has a solution, given that "x" and "y" are real. [ARML]

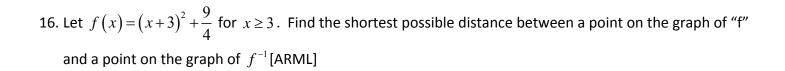
^{11. &}quot;P" is a fixed point on the diameter \overline{AB} of a circle. Prove that for any chord \overline{CD} of the circle that is parallel to \overline{AB} , we have $PC^2 + PD^2 = PA^2 + PB^2$





14. An equilateral triangle is inscribed in the ellipse whose equation is $x^2 + 4y^2 = 4$. One vertex of the triangle is (0,1), and one altitude is contained in the y-axis. Find the length of each side of the triangle [AIME]

15. Given that $x^2 + y^2 = 14x + 6y + 6$, what is the largest possible value that 3x + 4y can have? [AHSME]



17. Determine the unique pair of real numbers (x,y) that satisfy the equation:

$$(4x^2 + 6x + 4)(4y^2 - 12y + 25) = 28$$

18. The graph of $2x^2 + xy + 3y^2 - 11x - 20y + 40 = 0$ is an ellipse in the first quadrant of the xy-plane. Let "a" and "b" be the maximum and minimum values of $\frac{y}{x}$ over all points (x, y) on the ellipse. What is the value of "a+b" [AMC]