Goal: 32
Total: 40

1. Find, with proof, the largest number of times a quadratic and a circle can intersect. (2)

2. Prove that two lines are parallel if and only if they share the same slope, with different y intercepts. (2)

3. If we freely rotate the point $(5, 8)$ around the point $(9, 5)$ and the point $(6, 17)$ around the point $(4, 17),$ what is the minimum distance these two rotated points could have from each other? (3)

4. What about the maximum distance they could have from each other? (3)

5. If $x^2 + 8x + y^2 - 10y = 23,$ find the sum of the maximum and minimum values of $x^2 + y^2.$ $(\star 5)$

6. Find the equation of the line, in any form, such that any point on that line makes an isosceles triangle in conjunction with points $(5, 2)$ and $(7, 4).$ (3)

7. Find the area of the triangle whose vertices lie on $(3, 5), (4, 9), (-4, -6).$ (2)

8. Find the area of the polygon whose vertices lie on $(-1, 1), (1, 1), (1, -1), (-4, -4).$ (2)

9. If the area of the polygon made by points $(5, 3), (3, 8), (4, 6), (x, y)$ is $4,$ find the equation of the two lines that encompass all possible points $(x, y).$ $(\star 6)$

10. What is the area of the region bounded by $2x + 3y = 21$ and $5x + 2y = 25?$ (4)

11. Let $x = (10, 1)$ and circle C be the graph $(x - 1)^2 + (y + 2)^2 = 10.$ Let Y be the point on C closest to $X.$
    a) Find $XY.$ (3)
    b) Find the coordinates of $Y.$ $(\star 5)$