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MTH 211, Math for Architects, Exam II, Spring 2014

Ayman Badawi

QUESTION 1. (10 points). Consider

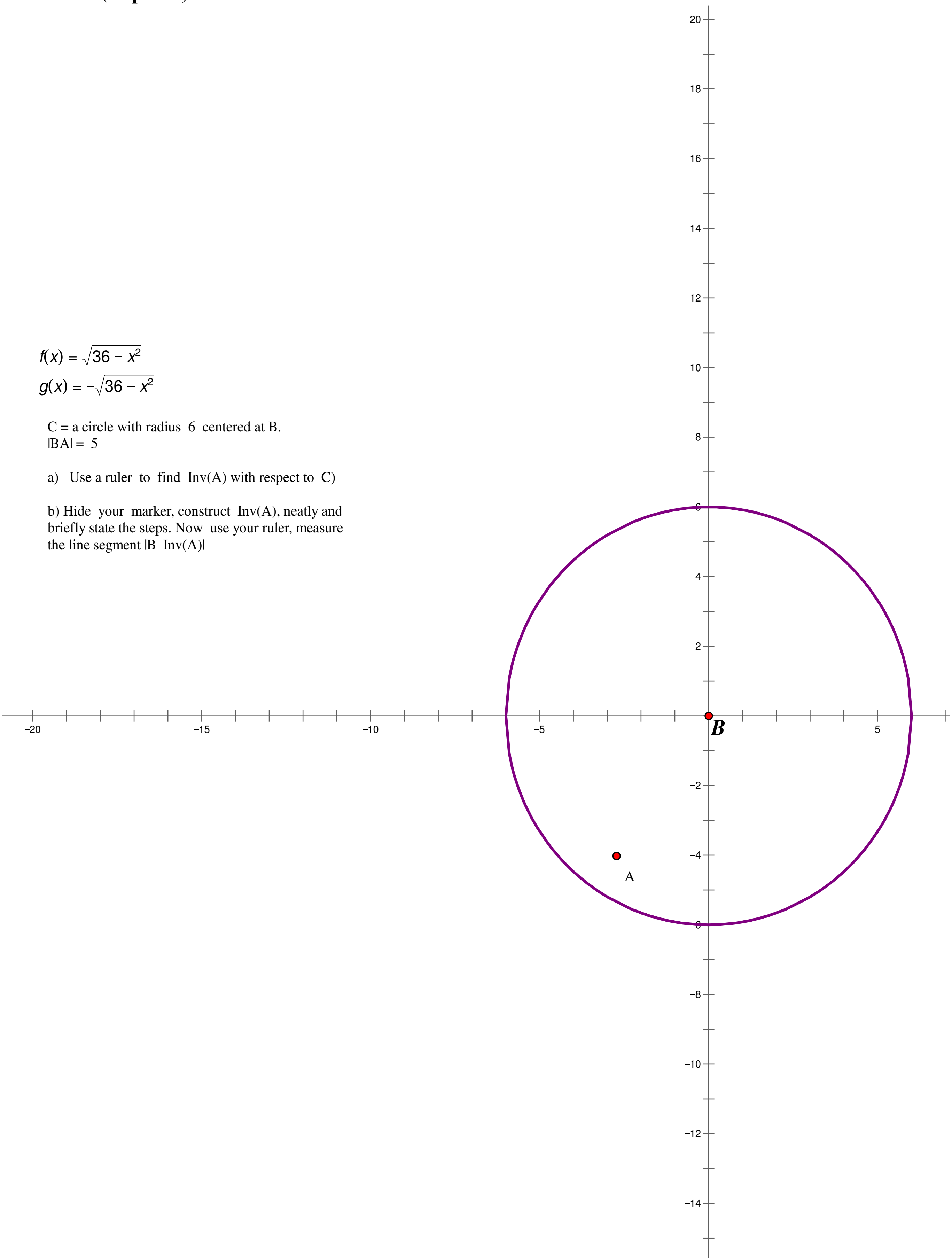
$f(x) = \sqrt{36 - x^2}$

$g(x) = -\sqrt{36 - x^2}$

C = a circle with radius 6 centered at B.
|BA| = 5

a) Use a ruler to find Inv(A) with respect to C)

b) Hide your marker, construct Inv(A), neatly and briefly state the steps. Now use your ruler, measure the line segment |B Inv(A)|



QUESTION 2. (10 points). Consider

$f(x) = \sqrt{64 - x^2}$

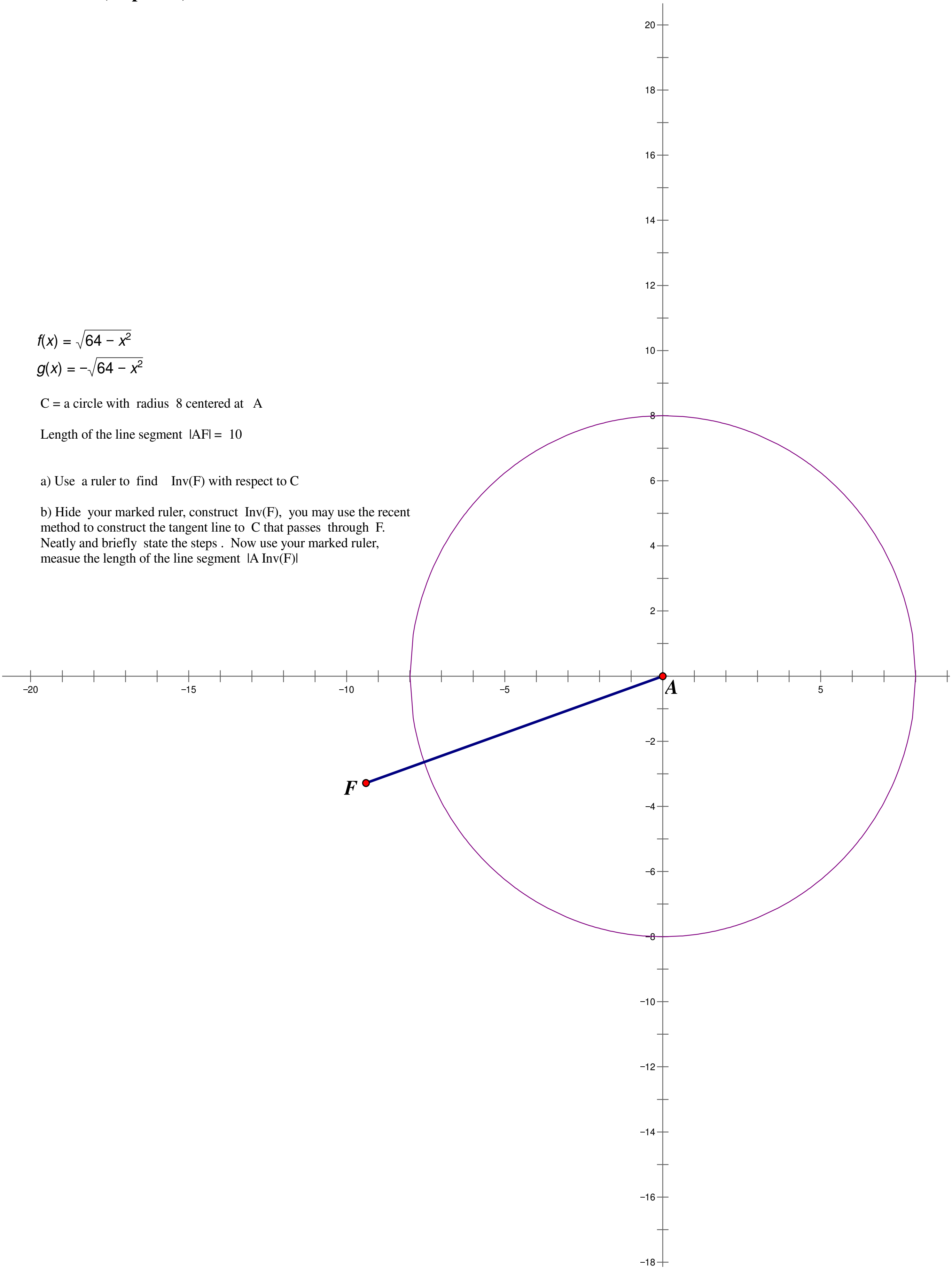
$g(x) = -\sqrt{64 - x^2}$

C = a circle with radius 8 centered at A

Length of the line segment |AF| = 10

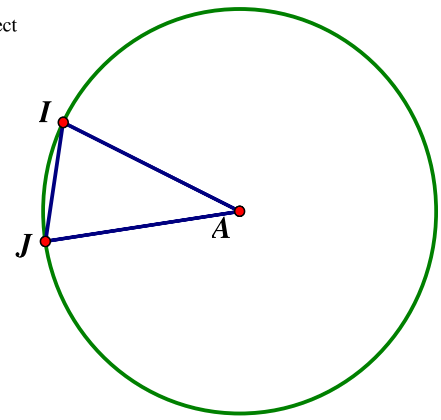
a) Use a ruler to find Inv(F) with respect to C

b) Hide your marked ruler, construct Inv(F), you may use the recent method to construct the tangent line to C that passes through F. Neatly and briefly state the steps . Now use your marked ruler, measue the length of the line segment |A Inv(F)|

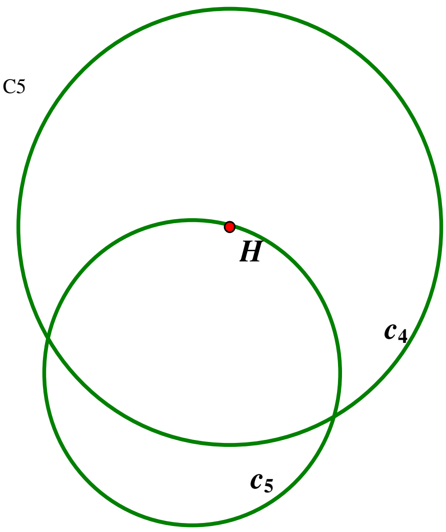


QUESTION 3. (10 points). Consider

C is a circle centered at A. Find the general shape of the inversion of the triangle AIJ with respect to C. You dont need to do the actual (exact) inversion,



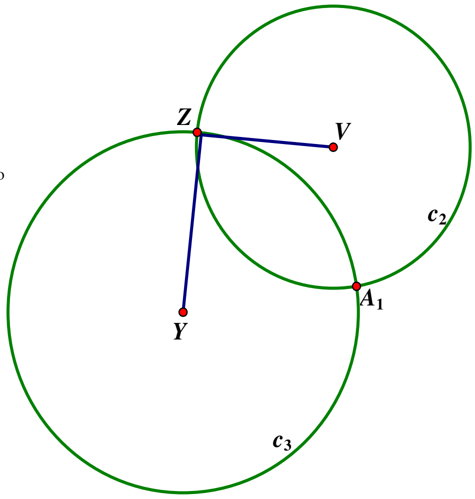
C4 is a circle centered at H. Find the exact (the actual) inversion of C5 with respect to C4.



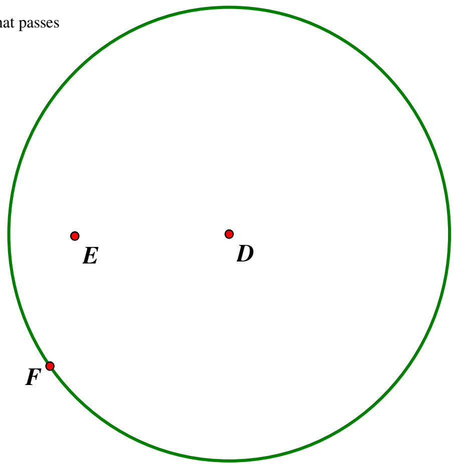
QUESTION 4. (20 points). Consider

Given ZV is perpendicular to ZY at Z. What is the inversion of the circle C3 with respect to C2? explain

What is the inversion of the arc ZA1 of the circle C3 that is inside C2 with respect to C2?



Given a circle C centered at D. State neatly and briefly the steps that you would follow in order to construct a circle M that passes through E and F such that M is orthogonal to C.



For the non-Euclidean hyperbolic geometry, answer the following::

1) Sum of the interior angles of any triangle is always ....

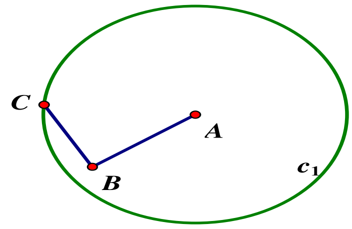
2) If Q is a point not on a line L, how many lines are there passing through Q and parallel to L?

3) If Q is a real point and B is a horizon point, then what is the maximum number of lines that are passing through Q and B?

QUESTION 5. (15 points). Consider

C1 is a circle with radius 5 centered at A, CB is perpendicular to AB at B and assume |CB| = 3.

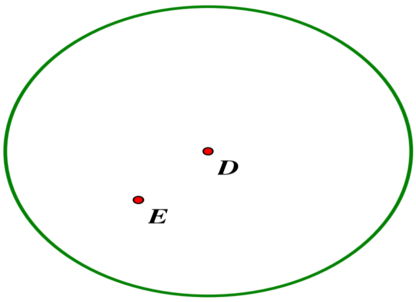
1) Find the length of the line segment AInv(B), i.e., find |AInv(B)|.



C is a circle with radius 4 centered at D. |DE| = 2. Let L be a circle passes through E and orthogonal to C.

1) What is the smallest radius of L?

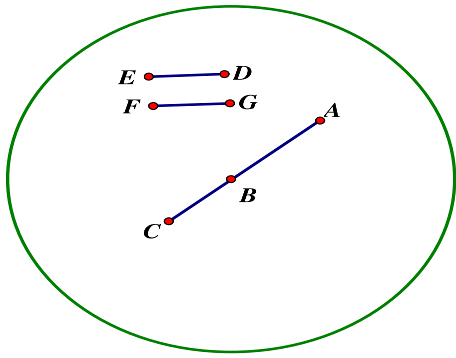
2) Can we construct such L with radius sqrt{13}? If yes construct such L with radius EXACTLY sqr{13}



QUESTION 6. (15 points). Consider

Given the Hyperbolic circle H with radius 6 centered at B. Given C, B, A lie on the same line segment AC, d(A, B) = 4, d(C, B) = 2.

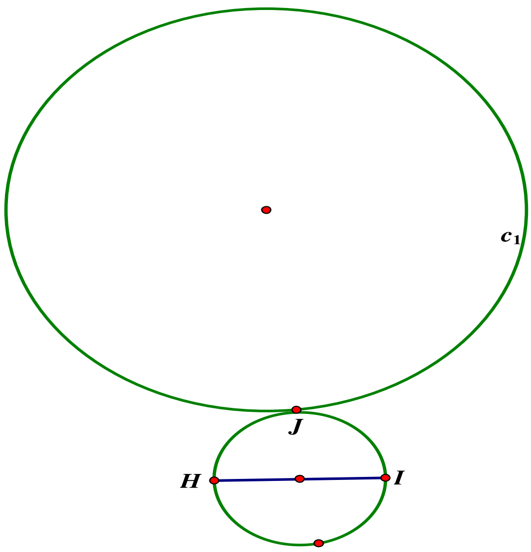
1) Find the hyperbolic distance between A and C, i.e. find d_h(A, C)



2) Given d(E, D) = d(F, G) (see picture). Can we conclude that d_h(E, D) = d_h(F, G)? d_h(E, D) < d_h(F, G)? d_h(E, D) > d_h(F, G)? briefly Explain your conclusion.

Find the inversion of HIJ with respect to C1. Just draw the general shape of the inversion (it need not be exact).

Note that HIJ consists of the line segment HI and the upperhalf ARC.



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