MTH 211, Final Exam, spring 2014

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QUESTION 1. (i) To tile a floor, we may use pieces of a regular 12-gon with :

a) pieces of regular 3-gon and pieces of regular 6-gon b) pieces of regular 8-gon c) pieces of regular 4-gon d) pieces of regular regular 6-gon and pieces of regular 6-gon.

(ii) To tile a floor, we may use pieces of regular 4-gon with:

a) pieces of regular 12-gon and pieces of regular 3-gon b) pieces of regular 8-gon and pieces of regular 3-gon. c) pieces of regular 3-gon. d) (a) or (c).

(iii) To a tile a floor, we may use pieces of regular 8-gon with:

a) pieces of regular 3-gon b) pieces of regular 4-gon c) pieces of regular 6-gon d) (a) or (b)

(iv) Let K_n be a sequence such that $K_0 = 2$, $K_1 = 1$, and $K_n = K_{n-1} + 6K_{n-2}$ for each $n \geq 2$. Then $K_3 =$

a) 13 b) 35 c) 19 d) 5

(v) The general formula for K_n is

a) $2^n - 3^n$ b) $3^n + 2^n$ c) $2^n + (-3)^n$ d) $3^n + (-2)^n$

(vi) Define a function h over the points in the xy-plane such that if $w = (a, b)$ is a point in the plane viewed as $w = a + bi$, then $h(w) = (-4, -4).w$, where " . " indicates complex-multiplication. Then $h((1, 2)) =$

a) (4, -12) b) (-12, -12) c) (12, -124) d)(-12, 4)

(vii) The angle of rotation of the above h is :

a)45 clockwise b) 135 clockwise c) 45 counter clockwise d) 180 clockwise

(viii) The stretching factor of h above is :

a)4 b) $4\sqrt{2}$ c) 4 d) 8

(ix) Let C be a circle of radius 4 centered at O, and A is a point inside C such that $\mid OA \mid= 2$. Then $\mid AInv(A) \mid$ =

a) 8 b)6 c) 4 d) 10

(x) Let C be a circle centered at A with radius 6 and D is another circle with radius 2 centered at B such that D is passing through A. Then the inversion of D with respect to C is :

a) a line that is perpendicular to the line AB at a point F such that $|AF| = 9$ b) a line that is perpendicular to the line AB at a point F such that $|AF| = 3$ c) a circle with radius 3 passing through A d)a circle with radius 4 passing through A .

(xi) Let C be a circle centered at O. Given A, B are points such that O, A, B lie on the same line and $\mid OA \mid<\mid OB \mid$. Then

a) $\mid Inv(A)Inv(B) \mid=\mid AB \mid$ b) $\mid OInv(A) \mid<\mid OInv(B) \mid$ c) $\mid OInv(B) \mid<\mid OInv(A) \mid$ d) We can not tell

(xii) The measurement of each vertex-angle of a regular 20-gon is

a) 144 (b) 162 c) 18 d) 36

(xiii) One of the following is constructible by unmarked ruler and a compass:

a) regular 26-gon b) regular 40-gon c) regular 38-gon d) regular 54-gon

(xiv) Using unmarked ruler and a compass:

a) We can construct a 48 degree angle. b) We can construct a 10 degree angle. c) We can construct a 55 degree angle. d)None of the previous is true.

(xv) Let C be a circle centered at A with radius 6 and D is another circle with radius 2 centered at B such that $|AB| = 1$. Then the inversion of D with respect to C is :

a) A circle with radius 24 centered at L such that $|BL| = 13$. b) A circle with radius 4 centered at L such that $|BL| = 2$. c) A circle with radius 24 centered at L such that $|BL| = 11$. d) A circle with radius 24 centered at L such that $|BL| = 12$. e) None of the previous is correct.

(xvi) Let C be a circle centered at O and with radius 6. Given A is a point such that $\mid OA \mid= 2$ and D is a circle orthogonal to C and passing through A. Then one of the following values is a possibility for the radius of D:

a) 11 b)7.5 c) 6.5 d) 1.5

(xvii) Let H be the horizon circle (the model for non-Euclidean) with radius 4 and centered at O. Let A be a point in H such that $\mid OA \mid= 3$. Then the non-Euclidean distance between O and A is :

a) ln(3) b) ln(7) c) ln(9) = 2ln(3) d) ln(4)

(xviii) In non-Euclidean Geometry, it is possible to construct a triangle such that the sum of all vertex-angles =

a) 183 b) 180 c) 10 d) 201 e) (a) and (b) f) none of the previous is correct

(xix) Let C be a circle centered at A with radius 6 and D is another circle with radius r centered at B such that $|AB| = 10$ and D is orthogonal to C . Then the radius of the inversion of D with respect to C is :

a) 10 b) 6 c) 5 d)8 e) not enough information/ so we cannot answer the question.

(xx) Let C be a circle of radius 6 centered at O, A and B are points such that $|AO| = |BO| = 2$ and the angle AOB is a right angle at O. The radius of the circle that passes through A, B and orthogonal to C is (Just write the answer here, do not show me the work) ——————

(xxi) Let C be a circle with radius 5 and centered at $(0, 0)$. the inversion of the point $(3, 4)$ with respect to C is the point ——————

(xxii) Given a line segment AB. The following steps will be used to construct a point C on the line AB such that $\frac{|AB|}{|AC|} = 1 + \sqrt{5}$. Write at most 6 steps in order to locate the point c

a.

b.

c.

d.

e.

f.

(xxiii) Given a line segment AB and a line segments of length $1cm$. Write at most 4 steps in order construct a line segment of length $\sqrt{|AB|}$.

a.

b.

c.

d.

(xxiv) If AB is a line segment of length $X > 1$ and AD is another line segment of length Y and you are given a line segments of length $1cm$. Construct a point C on the line AD such that $X|AC| = Y$. Write at most 4 steps in order to locate C.

a.

b.

c.

d.

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