PROBLEMS ON ANALYTICAL GEOMETRY

I.8 In the XY plane, if the point (x,y) is equidistant from (1,0) and (0,2) then

(a) $x^2 + y^2 = 5$ (b) $2x - 4y + 3 = 0$ (c) $x^2 = 2y - 1$

(d) $(x - 1)^2 = (y - 2)^2$ (e) $y^2 = 2(x - 1)$

I.28 In how many points will the curves $x^2 + 4y^2 = 4$ and $y = 3x^2 - 3$ intersect?

(a) 0 or 1 (b) 2 (c) 3 (d) 4 (e) 5 or more

I.31 What is the point on the line $y = 2x$ nearest the point (4,2)?

(a) (1,2) (b) (8/5,16/5) (c) (7/2,3) (d) (2,5)
(e) (7/3,14/3)

II.4 The number of points in the intersection of the graphs of $x^2 - 4x + y^2 + 3 = 0$ and $x^2 - 2x + 4y^2 - 3 = 0$ is

(a) 0 (b) 1 (c) 2 (d) 3 (e) more than 3

II.17 Given the parabola $y = x^2$, for which of the following values of a is it not possible to draw a straight line from the point (2,a) tangent to the parabola?

(a) 1 (b) -1 (c) 2 (d) 3 (e) 5

II.29 In the Cartesian plane, the two tangent lines from the point (2,2) to the circle $x^2 + y^2 = 1$ intersect the circle at the points (a,b) and (c,d). Then a + b =

(a) 14/2 (b) 1/4 (c) 2/3 (d) 1/3 (e) 0

III.27 The plane region which is determined by the three inequalities $y < 2x$, $y > x$, $y < 6 - x$ contains how many points (m,n) where m and n are both integers?

(a) none (b) 1 (c) 2 (d) 5 (e) infinitely many

V.7 The graph of $y = f(x)$ may be obtained from the graph of $y = f(2x)$ by (a) shifting it upwards () shifting it to the right (c) stretching it horizontally (d) reflecting it about the line $y = 2x$ (e) a rotation

V.8 The graph of which equation is symmetric about the x axis? (a) $x^2 + y = 0$ (b) $x^2 - y^3 = 0$ (c) $x^2 + y^2 - \sin y = 0$ (d) $x^2 \cos y + y = 0$ (e) $x^2 + y \sin y = 0$

V.9 If $CD \neq 0$ then the graph of $x^2 + y^2 + Cx + D = 0$ is a circle (a) if $C < 2D$ (b) if $C^2 > 4D$ (c) if $C > (D + 4)^{1/2}$ (d) always (e) never

VI.6 If the graph of $y = f(x)$ contains the point $(3,7)$ then the graph of $y = 3f(x - 2) + 5$ must contain the point
(a) $(5,26)$ (b) $(9,14)$ (c) $(21,15)$ (d) $(20,7)$
(e) $(8,12)$

VI.25 The area of the set of points (x,y) such that $|y - x| \leq 3$ and $|y + x| \leq 2$ is
(a) 6 (b) 9 (c) 12 (d) 15 (e) 18

VII.2 If the lines $ax + by = c$ and $dx + ey = f$ are perpendicular then (a) $ae = -1$ (b) $c = -1/f$ (c) $ad + be = 0$ (d) $af + dc = 0$ (e) $ab = -1/de$

VII.6 If the graph of $x^2 + (y - 3)^2 = 10$ is shifted 4 units to the right and 5 units down then it contains the point
(a) $(5,1)$ (b) $(6,-1)$ (c) $(2,0)$ (d) $(6,-3)$ (e) $(3,2)$

VII.16 The line in the Cartesian plane through the point (a,b) and having slope 3 intersects the circle $x^2 + y^2 = 1$ in at least one point provided
(a) $|b - 3a| \leq (10)^{1/2}$ (b) $a^2 + b^2 \leq 9$ (c) $|a - 3b| \leq 4$
(d) $|b| \leq |9a + 1|$ (e) $|a^2 - b| \leq 3(2)^{1/2}$

VIII.18 The line $y = 3x + 4$ is tangent to the circle $x^2 + y^2 = r^2$ if $r =$ (a) $3/(2)^{1/2}$ (b) $3/4$ (c) $(14)^{1/2}/3$ (d) $(10/3)^{1/2}$ (e) $(8/5)^{1/2}$

IX.20 The graph of the equation $y = 3x + 5$ is shifted 2 units to the right and 4 units up; it is then rotated 90 degrees counterclockwise about the origin. The equation of the resulting graph is (a) $x + 3y - 3 = 0$ (b) $2y = 5x + 9$ (c) $2x + 5y = 3$ (d) $4x + 9y = 7$ (e) $3x + 9y + 7 = 0$

IX.25 For what values of $a > 1$ do the two tangent lines from the point $(a,0)$ to the circle $x^2 + y^2 = 1$ meet at right angles?
(a) 2 (b) $2^{1/2}$ (c) $3/2$ (d) $3^{1/2}$ (e) $3^{1/2}/2$

X.20 For $a > 0$ the slope of a line through the point $(0,-a)$ which intersects the parabola $y = x^2$ in exactly one point is
(a) a^2 (b) $2a$ (c) $a^3/3$ (d) $a/2$ (e) $2a^{1/2}$

X.27 If the hyperbola xy is shifted 3 units to the right and then rotated 90 degrees clockwise about the origin, the equation of the resulting hyperbola is (a) $xy - 3x = 3$ (b) $xy + 3y = 1$ (c) $xy + 3x = -1$ (d) $3xy + x = 1$ (e) $xy + 3x = -1$