

DISTANCE FORMULA:

#1 Find the distance between (8, -5) and (3, 7)

$$\sqrt{(3-8)^2 + (7-(-5))^2}$$

$$\sqrt{(-5)^2 + (12)^2} = 13$$

#2 Find the distance between $(\frac{2}{3}, \frac{3}{5})$ and $(-\frac{1}{3}, \frac{9}{5})$

$$\sqrt{(\frac{2}{3} - (-\frac{1}{3}))^2 + (\frac{3}{5} - \frac{9}{5})^2} = \sqrt{\frac{61}{25}} = \frac{\sqrt{61}}{5}$$

#3 The distance between (8, -2) and (2, x) is 10. Find x

$$10 = \sqrt{(2-8)^2 + (x-(-2))^2}$$

$$100 = 36 + (x+2)^2$$

$$\pm 8 = x+2 \longrightarrow x = 6, -10$$

#4 A triangle has vertices at (4, 1) (1, -2) and (6, -4). What kind of triangle is it?

by distance formula

$$\overline{AB} = \sqrt{18}$$

$$\overline{AC} = \sqrt{29}$$

$$\overline{BC} = \sqrt{29}$$

MIDPOINT FORMULA:

#5 What is the midpoint of the points (19, 2) and (-3, 8)

$$(\frac{19+(-3)}{2}, \frac{2+8}{2})$$

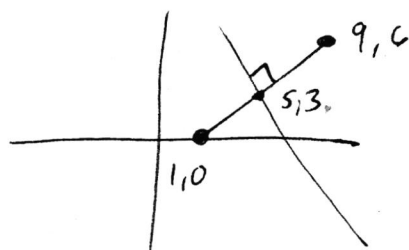
$$8, 5$$

#6 The midpoint of the points (A, B) and (9, -12) is (6, 4). Find (A, B)

$$6 = \frac{A+9}{2} \quad 4 = \frac{B+(-12)}{2}$$

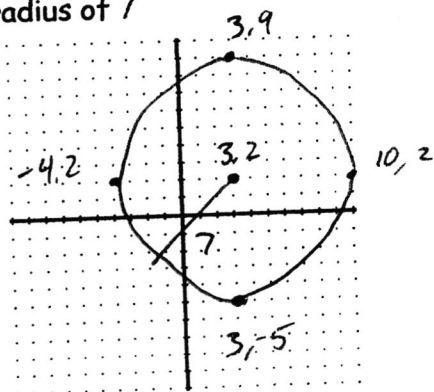
$$(A, B) = (3, 20)$$

#7 Write the equation of the perpendicular bisector of the segment between (1, 0) and (9, 6).

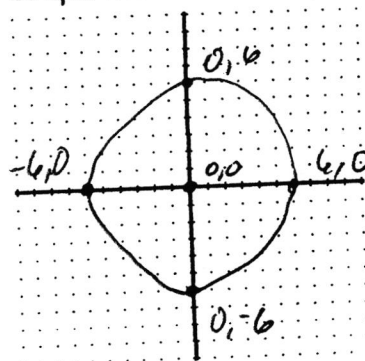


$$y = -\frac{4}{3}x + \frac{29}{3}$$

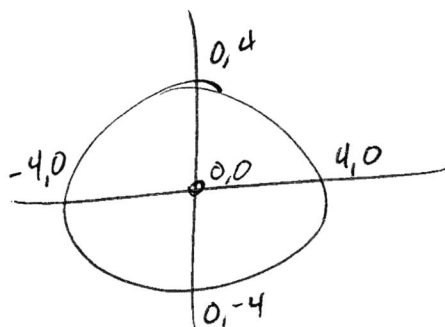
#8 Graph a circle centered at (3,2) with a radius of 7



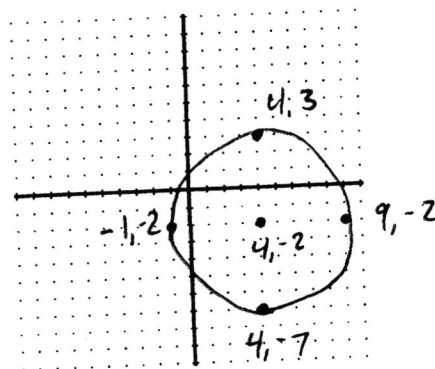
#9 Graph the circle $x^2 + y^2 = 36$



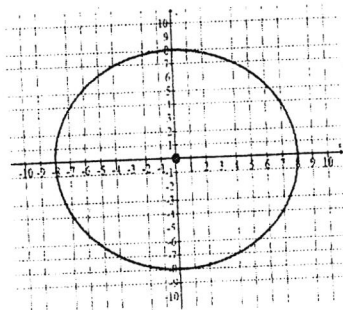
#10 Sketch the graph of the circle $x^2 + y^2 = 16$ (label the x and y intercepts)



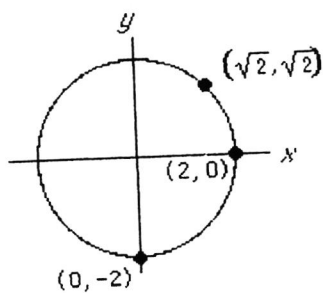
#11 Graph the circle $(x-4)^2 + (y+2)^2 = 25$



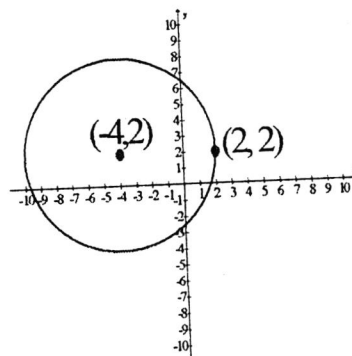
#12 Write the equation for each of the following circles:



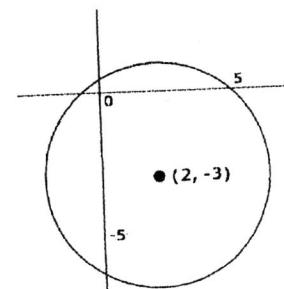
$$x^2 + y^2 = 64$$



$$x^2 + y^2 = 4$$



$$(x+4)^2 + (y-2)^2 = 36$$



$$(x-2)^2 + (y+3)^2 = 18$$

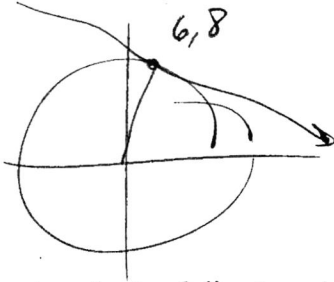
#13 Write the equation of the circle centered at (2, 8) passing through (5, 12)

$$(x-2)^2 + (y-8)^2 = 25$$

#14 Write the equation of a circle centered at $(-5, 4)$ with a radius of 9.

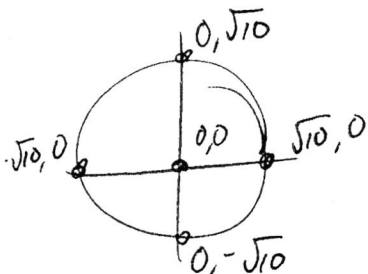
$$(x+5)^2 + (y-4)^2 = 81$$

#15 Write the equation of the line tangent to the circle $x^2 + y^2 = 10$ at the point $(6, 8)$



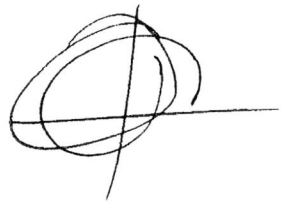
$$y = -\frac{3}{4}x + \frac{25}{2}$$

#16 Sketch the following circle, label all the X and Y intercepts $2x^2 + 2y^2 = 20$



Divide
by
2

$$x^2 + y^2 = 10$$



#17 Write the equation of the line tangent to the circle at the given point: $x^2 + y^2 = 25$, $(3, 4)$

$$y = -\frac{3}{4}x + \frac{25}{4}$$

#18 Write the equation of the line tangent to the circle at the given point: $x^2 + y^2 = 53$, $(-2, -7)$

$$y = -\frac{2}{7}x + \frac{-53}{7}$$

Practice B

For use with pages 589–594

Find the distance between the two points. Then find the midpoint of the line segment joining the two points.

1. $(4, -3), (6, 2)$ $\sqrt{29}$ $(5, \frac{1}{2})$ 2. $(-2, -5), (4, 6)$ $\sqrt{157}$ $(1, \frac{1}{2})$ 3. $(-5, 0), (-2, -2)$ $\sqrt{13}$ $(-\frac{3}{2}, -1)$
 4. $(6, 1), (2, -5)$ $2\sqrt{13}$ $(4, -2)$ 5. $(2.5, -1), (-1.7, 7)$ 9.04 $(.4, 3)$ 6. $(\frac{2}{3}, 6), (-\frac{1}{3}, 2)$ $\sqrt{17}$ $(\frac{1}{6}, 4)$

The vertices of a triangle are given. Classify the triangle as *scalene*, *isosceles*, or *equilateral*.

7. $(-1, 3), (6, 1), (2, -5)$ *Scalene* $\sqrt{53}, \sqrt{52}, \sqrt{73}$ 8. $(9, -2), (3, 6), (-3, -2)$ *Isosceles* $10, 10, 12$ 9. $(8, 5), (1, -2), (-3, 2)$ *Scalene* $\sqrt{98}, \sqrt{32}, \sqrt{130}$
 $7\sqrt{2}, 4\sqrt{2}$

Write an equation for the perpendicular bisector of the line segment joining the two points.

10. $(9, -2), (-3, 2)$ $y = 3x - 9$ 11. $(2, 5), (-1, 7)$ $y = \frac{3}{2}x + \frac{17}{2}$ 12. $(0, 6), (2, 4)$ $y = x + 4$

Use the given distance d between the two points to solve for x .

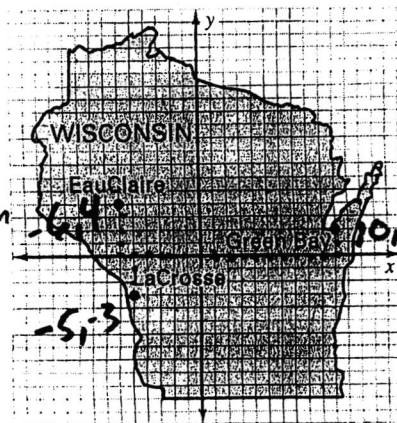
13. $(-3, 2), (-10, x)$; $d = \sqrt{53}$ $4 \text{ or } 0$ 14. $(3, x), (5, 7)$; $d = 2\sqrt{17}$ $15 \text{ or } 1$

Wisconsin In Exercises 15–18, use the following information.

A coordinate plane is placed over the map of Wisconsin shown at the right. Each unit represents 10.5 miles.

15. Approximate the distance in miles between LaCrosse and Green Bay. $5\sqrt{10} \times 10.5$ 166.02 miles
 16. How long would a flight from LaCrosse to Green Bay take traveling at 225 miles per hour? $\frac{166}{225} = .74 \text{ hours or } 44 \text{ min}$
 17. Approximate the distance in miles between Eau Claire and LaCrosse. $\sqrt{50} \times 10.5$ 74.25 mi
 18. What is the minimum time necessary to walk from Eau Claire to LaCrosse walking at a rate of five miles per hour?

$$\frac{74}{5} \quad 14.8 \text{ hours}$$



CIRCLES

3

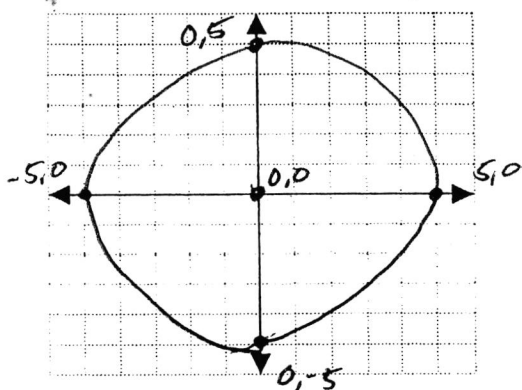
member... **circumference (perimeter) = $d\pi$** and **area = πr^2**

The standard form of the equation of a circle with the center at $(0, 0)$ and radius r , is...

$$x^2 + y^2 = r^2$$

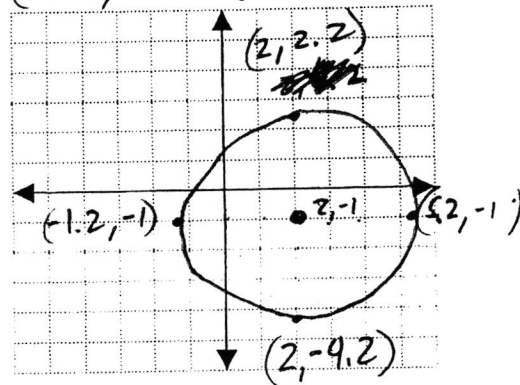
1. graph $x^2 + y^2 = 25$

Label the intercepts.



2. graph $(x-2)^2 + (y+1)^2 = 10$

$(2, -1)$ $r = \sqrt{10}$ or 3.2



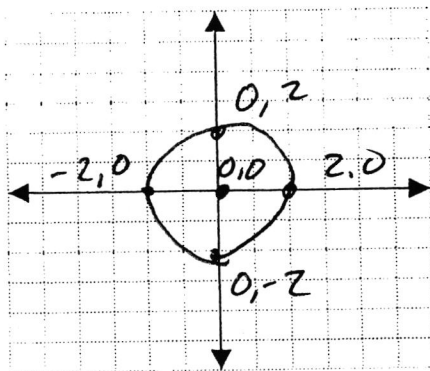
3. graph $36x^2 + 36y^2 = 144$

Label the intercepts.

Divide by 36

$$x^2 + y^2 = 4$$

$(0,0)$ $r = 2$



4. Write the equation of a circle that has a center of $(0, 0)$ and a radius of 10.

$$x^2 + y^2 = 100$$

$$(x-0)^2 + (y-0)^2 = 10^2$$

5. Write the equation of a circle that has a center of $(8, -4)$ and a radius of $\sqrt{6}$.

$$(x-8)^2 + (y+4)^2 = 6$$

6. Write the equation of a circle that has a center of $(0, 0)$ and passes through $(-2, 5)$

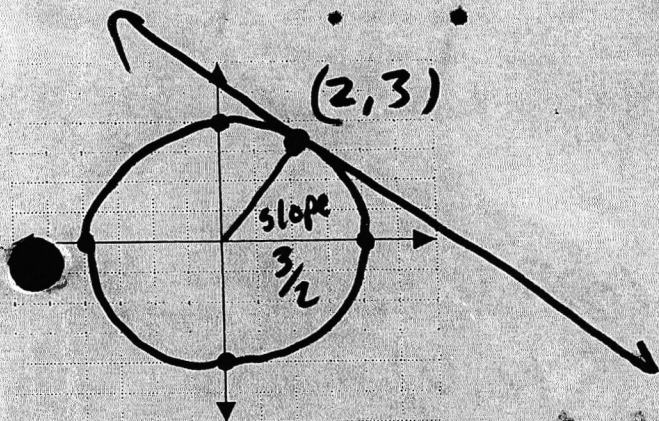
$$x^2 + y^2 = 29$$

7. Write the equation of a circle that has a center of $(7, -2)$ and passes through $(1, -8)$

$$(x-7)^2 + (y+2)^2 = 72$$

8. The equation of a circle and a point on the circle is given. Write an equation of the line that is tangent to the circle at that point.

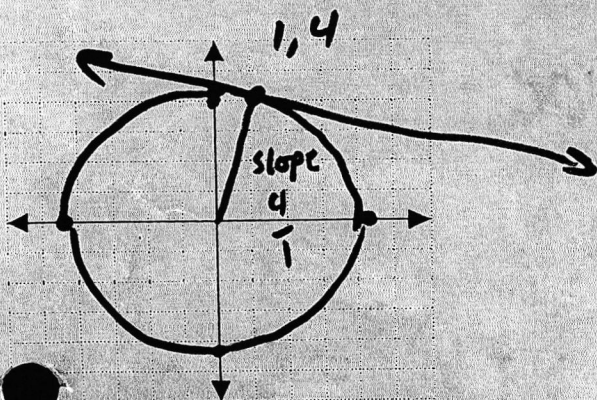
$x^2 + y^2 = 13$ at $(2, 3)$



$$y = -\frac{2}{3}x + \frac{13}{3}$$

9. The equation of a circle and a point on the circle is given. Write an equation of the line that is tangent to the circle at that point.

$x^2 + y^2 = 17$ at $(1, 4)$



$$y = -\frac{1}{4}x + \frac{17}{4}$$

Find the distance between point $C(-3, -2)$ and point $F(5, 8)$, then find the midpoint of \overline{CF} .

$$\sqrt{8^2 + 10^2} = \sqrt{164} =$$

[1] _____

(1, 3)

2. Find the distance between point $A(3, 3)$ and point $C(4, 8)$, then find the midpoint of \overline{AC} .

[2] _____

~~[A]~~ distance = $\sqrt{170}$
midpoint = $\left(-\frac{1}{2}, -\frac{5}{2}\right)$

[B] distance = $\sqrt{26}$
midpoint = $\left(\frac{7}{2}, \frac{11}{2}\right)$

~~[C]~~ distance = $\sqrt{170}$
midpoint = $\left(\frac{7}{2}, \frac{11}{2}\right)$

[D] distance = $\sqrt{26}$
midpoint = $\left(-\frac{1}{2}, -\frac{5}{2}\right)$

3. A highway map of Ohio has a coordinate grid superimposed on top of the state. Springfield is at point $(-3, -2)$ and Cleveland is at point $(6, 3)$. The Springfield History Club is going to Cleveland to see the Rock and Roll Hall of Fame. The map shows a highway rest area halfway between the cities. What are the coordinates of the rest area?
What is the distance between Springfield and Cleveland? (one unit = 15.54 miles)

[A] rest area = $\left(\frac{9}{2}, \frac{5}{2}\right)$
Cleveland = 44 miles

$9^2 + 5^2$
 $\sqrt{96} \times 15.54$

[B] rest area = $\left(\frac{1}{2}, \frac{3}{2}\right)$
Cleveland = 116 miles

[C] rest area = $\left(-\frac{9}{2}, \frac{5}{2}\right)$
Cleveland = 49 miles

[D] rest area = $\left(\frac{3}{2}, \frac{1}{2}\right)$
Cleveland = 160 miles

[3] _____

D

4. The vertices of a triangle are given. Classify the triangle as scalene, isosceles, or equilateral.

$X(-2, 0)$, $Y(2, 0)$ and $Z(0, 2\sqrt{3})$

\overline{XY} $\sqrt{4^2 + 0^2} = 4$

\overline{XZ} $\sqrt{2^2 + 2\sqrt{3}^2} = 4$

\overline{YZ} $\sqrt{2^2 + 2\sqrt{3}^2} = 4$

[4] equilateral

5. Use the given distance d between the two points to solve for x .

a) $(-3, 2), (-10, x)$; $d = \sqrt{53}$ b) $(3, x), (5, 7)$; $d = 2\sqrt{17}$

$$\sqrt{(-3 - (-10))^2 + (2 - x)^2} = \sqrt{53} \quad \sqrt{(3 - 5)^2 + (x - 7)^2} = \sqrt{68}$$

$$49 + (2 - x)^2 = 53$$

$$(2 - x)^2 = 4$$

$$2 - x = \pm 2$$

$$x = 0, 4$$

$$4 + (x - 7)^2 = 68$$

$$(x - 7)^2 = 64$$

$$x - 7 = \pm 8$$

$$x = 15, -1$$

[5]

6. Write an equation for the perpendicular bisector joining the following segments.

a) $(4, -6)$ and $(-2, 4)$ $\frac{10}{-6} = -\frac{5}{3}$

mid: $(1, -1)$

pt: $(1, -1)$ slope $\frac{3}{5}$

$$y = \frac{3}{5}x + \frac{-8}{5}$$

$$-1 = \frac{3}{5} + b$$

$$-\frac{8}{5}$$

b) $(2, 5)$ and $(-1, 7)$ $\frac{2}{-3}$

mid: $(.5, 6)$

$$y = \frac{3}{2}x + \frac{21}{4}$$

$$6 = \frac{3}{2} \cdot \frac{1}{2} + b$$

$$6 = \frac{3}{4} + b$$

$$\frac{21}{4}$$

[6]

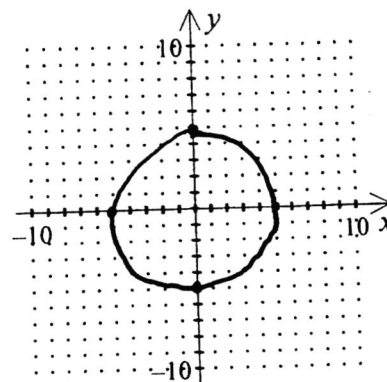
7. Write the standard form of the equation of the circle with radius 7 and center at $(0, 0)$.

$$x^2 + y^2 = 49$$

[7]

$$3x^2 + 3y^2 = 75$$

$$x^2 + y^2 = 25$$

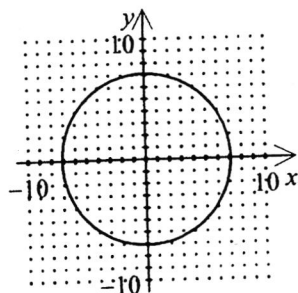


[8]

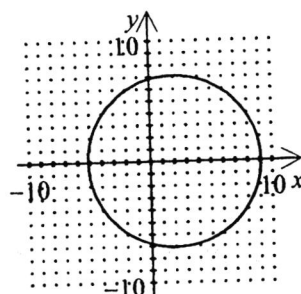
[9] _____

9. $3x^2 + 3y^2 = 75$

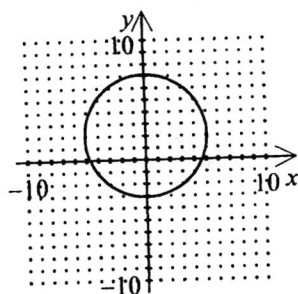
[A]



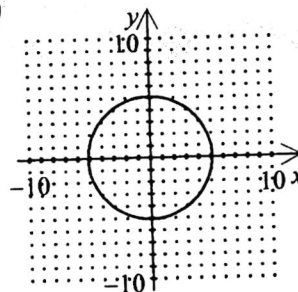
[B]



[C]



[D]



10. Write the standard form of the equation of the circle that passes through the point (0, 1) with its center at the origin.

$$x^2 + y^2 = 1$$

[10] $x^2 + y^2 = 1$

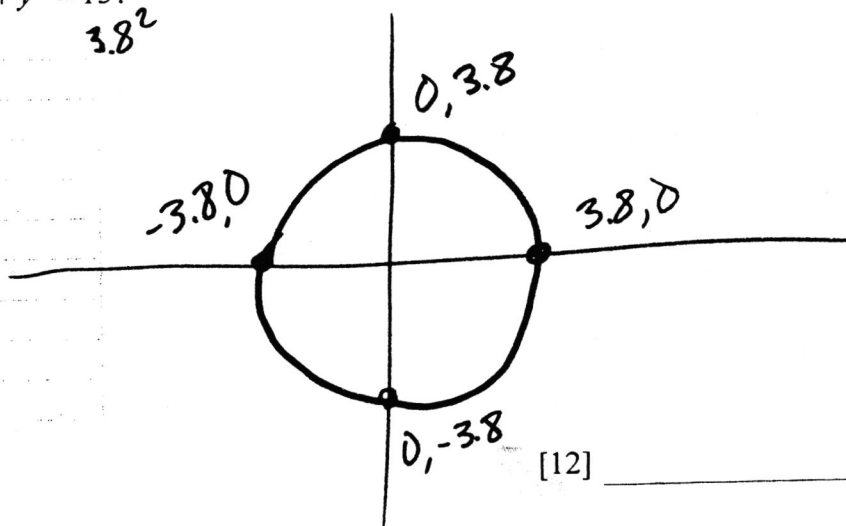
11. Write the standard form of the equation of the circle that passes through the point (3, 4) with its center at the origin.

$$x^2 + y^2 = 25$$

[11] $x^2 + y^2 = 25$

12. Sketch the graph of $x^2 + y^2 = 15$.

3.8^2

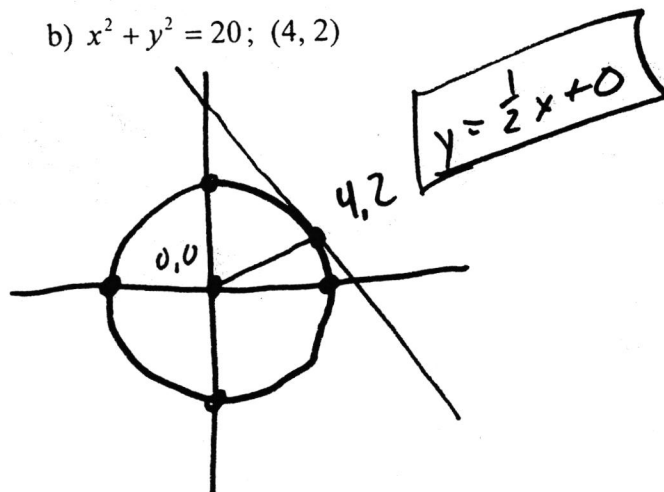
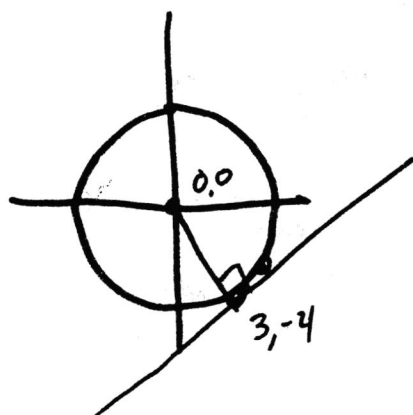


[12]

13. Write an equation of the line that is tangent to the given circle at the given point

a) $x^2 + y^2 = 25$; $(3, -4)$

b) $x^2 + y^2 = 20$; $(4, 2)$



[13]

$$y = \frac{3}{4}x + \frac{-25}{4}$$

$$-4 = \frac{3}{4} \cdot 3 + b$$

$$-4 = \frac{9}{4} + b$$

$$-\frac{16}{4} = \frac{9}{4} + b$$

$$y = -2x + b$$

$$y = -2x + 10$$

$$2 = -2 \cdot 4 + b$$

$$2 = -8 + b$$