

Honors Math 3 - Equations of Circles

① center (4, -12)

$$\text{area} = 25\pi$$

$$25\pi = \pi r^2 \rightarrow r = 5$$

$$(x-4)^2 + (y+12)^2 = 25$$

② center (-8, 2)

$$\text{Area} = 16\pi$$

$$16\pi = \pi r^2 \rightarrow r = 4$$

$$(x+8)^2 + (y-2)^2 = 16$$

③ center (4, 15)

circumference 6π

$$6\pi = 2\pi r \rightarrow r = 3$$

$$(x-4)^2 + (y-15)^2 = 9$$

④ center (-1, -7)

circumference 14π

$$14\pi = 2\pi r \rightarrow r = 7$$

$$(x+1)^2 + (y+7)^2 = 49$$

⑤ center (3, 14)

pt. on circle: (4, 18)

$$r = \sqrt{(4-3)^2 + (18-14)^2}$$

$$r = \sqrt{1^2 + 4^2}$$

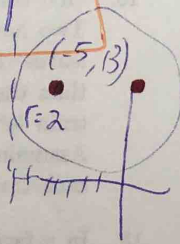
$$r = \sqrt{17}$$

$$(x-3)^2 + (y-14)^2 = 17$$

⑦ center (-5, 13)

tangent to $x = -7$

$$(x+5)^2 + (y-13)^2 = 4$$



⑥ center (5, 10)

pt. on circle (13, 13)

$$r = \sqrt{(13-5)^2 + (13-10)^2}$$

$$r = \sqrt{8^2 + 3^2}$$

$$r = \sqrt{64+9} \quad r = \sqrt{73}$$

$$(x-5)^2 + (y-10)^2 = 73$$

⑧ center (13, 14)

tangent to $x = 8$

$$13-8 = \sqrt{r^2}$$

$$(x-13)^2 + (y-14)^2 = 25$$

endpts of diameter
 $(-16, 12)$ $(-2, 2)$

mdpt. formula to find center:

$$\left(\frac{-16-2}{2}, \frac{12+2}{2} \right)$$

$$\text{center} = (-9, 7)$$

radius \rightarrow use distance formula
w/ center & either endpt
 $(-2, 2)$ & $(-9, 7)$

$$r = \sqrt{(-2+9)^2 + (2-7)^2}$$

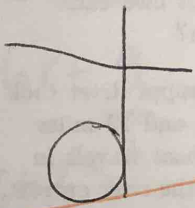
$$r = \sqrt{(7)^2 + (-5)^2}$$

$$r = \sqrt{49+25}$$

$$r = \sqrt{74}$$

$$(x+9)^2 + (y-7)^2 = 74$$

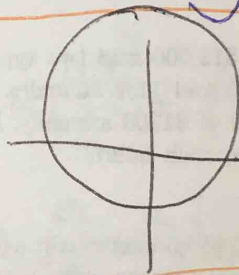
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$$(x+1)^2 + (y+4)^2 = 1$$

count units
for radius &
center

12



$$x^2 + (y-2)^2 = 16$$

10 endpts. of diameter
 $(-12, -4)$ and $(-4, -16)$

mdpt. formula to find center

$$\left(\frac{-12-4}{2}, \frac{-4-16}{2} \right)$$

$$\text{center} = (-8, -10)$$

radius \rightarrow use distance formula w/
center & either endpt,

$$(-12, -4) \quad (-8, -10)$$

$$r = \sqrt{(-12+8)^2 + (-4+10)^2}$$

$$r = \sqrt{(-4)^2 + (6)^2}$$

$$r = \sqrt{16+36} \quad r = \sqrt{52}$$

$$(x+8)^2 + (y+10)^2 = 52$$

$$0 = -x^2 - 315 + 24y + 28x - y^2$$

$$x^2 - 28x + y^2 - 24y = -315$$

$$x^2 - 28x + \left(\frac{28}{2}\right)^2 + y^2 - 24y + \left(\frac{-24}{2}\right)^2 = -315 + \left(\frac{28}{2}\right)^2 + \left(\frac{-24}{2}\right)^2$$

$$x^2 - 28x + 196 + y^2 - 24y + 144 = -315 + 196 + 144$$

$$(x-14)^2 + (y-12)^2 = 25$$

center: (14, 12)
radius: 5

$$(14) -30y + x^2 + y^2 + 20x = -316$$

$$x^2 + 20x + \left(\frac{20}{2}\right)^2 + y^2 - 30y + \left(\frac{-30}{2}\right)^2 = -316 + \left(\frac{20}{2}\right)^2 + \left(\frac{-30}{2}\right)^2$$

$$x^2 + 20x + 100 + y^2 - 30y + 225 = -316 + 100 + 225$$

$$(x+10)^2 + (y-15)^2 = 9$$

center: (-10, 15)
r: 3

$$(15) 6x + y^2 + 84 + x^2 = 20y$$

$$x^2 + 6x + \left(\frac{6}{2}\right)^2 + y^2 - 20y + \left(\frac{-20}{2}\right)^2 = -84 + \left(\frac{6}{2}\right)^2 + \left(\frac{-20}{2}\right)^2$$

$$x^2 + 6x + 9 + y^2 - 20y + 100 = -84 + 9 + 100$$

$$(x+3)^2 + (y-10)^2 = 25$$

center: (-3, 10)
r: 5

$$(16) 12x + 2y = -y^2 + 27 - x^2$$

$$x^2 + 12x + \left(\frac{12}{2}\right)^2 + y^2 + 2y + \left(\frac{2}{2}\right)^2 = 27 + \left(\frac{12}{2}\right)^2 + \left(\frac{2}{2}\right)^2$$

$$x^2 + 12x + 36 + y^2 + 2y + 1 = 27 + 36 + 1$$

$$(x+6)^2 + (y+1)^2 = 64$$

center: (-6, -1)
r: 8

$$(17) y^2 - 18y = -x^2 - 209 - 24x$$

$$x^2 + 24x + \left(\frac{24}{2}\right)^2 + y^2 - 18y + \left(\frac{-18}{2}\right)^2 = -209 + \left(\frac{24}{2}\right)^2 + \left(\frac{-18}{2}\right)^2$$

$$x^2 + 24x + 144 + y^2 - 18y + 81 = -209 + 144 + 81$$

$$(x+12)^2 + (y-9)^2 = 16$$

center $(-12, 9)$

$$r = 4$$

$$(18) y^2 + 44 - 16x + 8y = -x^2$$

$$x^2 - 16x + \left(\frac{-16}{2}\right)^2 + y^2 + 8y + \left(\frac{8}{2}\right)^2 = -44 + \left(\frac{-16}{2}\right)^2 + \left(\frac{8}{2}\right)^2$$

$$x^2 - 16x + 64 + y^2 + 8y + 16 = -44 + 64 + 16$$

$$(x-8)^2 + (y+4)^2 = 36$$

c: $(8, -4)$

$$r = 6$$

$$(19) 20y + 76 + y^2 = 10x - x^2$$

$$x^2 - 10x + \left(\frac{-10}{2}\right)^2 + y^2 + 20y + \left(\frac{20}{2}\right)^2 = -76 + \left(\frac{-10}{2}\right)^2 + \left(\frac{20}{2}\right)^2$$

$$x^2 - 10x + 25 + y^2 + 20y + 100 = -76 + 25 + 100$$

$$(x-5)^2 + (y+10)^2 = 49$$

c: $(5, -10)$

$$r = 7$$

$$(20) 26x = -300 - 24y - x^2 - y^2$$

$$x^2 + 26x + \left(\frac{26}{2}\right)^2 + y^2 + 24y + \left(\frac{24}{2}\right)^2 = -300 + \left(\frac{26}{2}\right)^2 + \left(\frac{24}{2}\right)^2$$

$$x^2 + 26x + 169 + y^2 + 24y + 144 = -300 + 169 + 144$$

$$(x+13)^2 + (y+12)^2 = 13$$

c: $(-13, -12)$

$$r = \sqrt{13}$$

$$1) y^2 - 20y + 4x = -x^2 - 95$$

$$x^2 + 4x + \left(\frac{4}{2}\right)^2 + y^2 - 20y + \left(\frac{-20}{2}\right)^2 = -95 + \left(\frac{4}{2}\right)^2 + \left(\frac{-20}{2}\right)^2$$

$$x^2 + 4x + 4 + y^2 - 20y + 100 = -95 + 4 + 100$$

$$(x+2)^2 + (y-10)^2 = 9$$

$$C: (-2, 10)$$

$$r = 3$$

$$2) -2x - 98 - 2y = -y^2 - x^2$$

$$x^2 - 2x + \left(\frac{-2}{2}\right)^2 + y^2 - 2y + \left(\frac{-2}{2}\right)^2 = 98 + \left(\frac{-2}{2}\right)^2 + \left(\frac{-2}{2}\right)^2$$

$$x^2 - 2x + 1 + y^2 - 2y + 1 = 98 + 1 + 1$$

$$(x-1)^2 + (y-1)^2 = 100$$

$$C: (1, 1)$$

$$r = 10$$