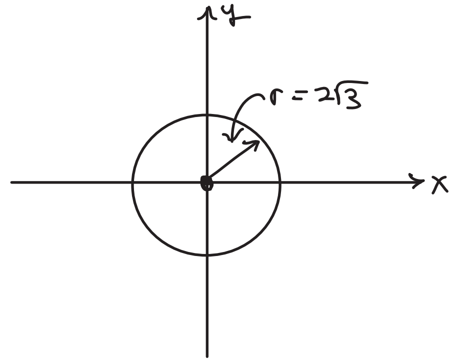
(a) $x^2+y^2-12=0$

$x^2+y^2=12$

$\frac{x^2}{12}+\frac{y^2}{12}=1$ ← center @ $(0,0)$

$r=\sqrt{12}=2\sqrt{3}$



(b) $x^2+y^2+12=0$

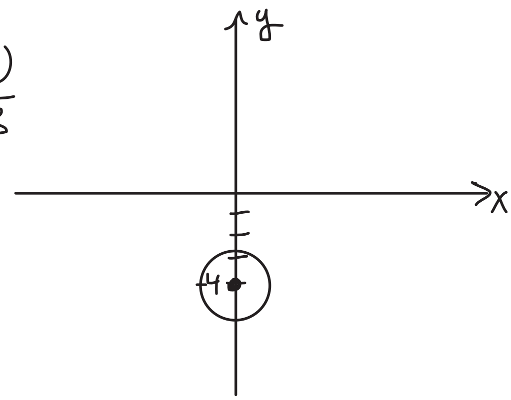
$x^2+y^2=-12$ ← $\sqrt{-12}=2i\sqrt{3}$ ← radius is not $\in \mathbb{R}$ ∴ this is not a circle.

(c) $x^2+y^2+8y=-13$

$x^2+y^2+8y+4^2=-13+16$ ← complete the square on y.

$x^2+(y+4)^2=3$

$\frac{x^2}{3}+\frac{(y+4)^2}{3}=1$ ← center @ $(0,-4)$, radius $r=\sqrt{3}$

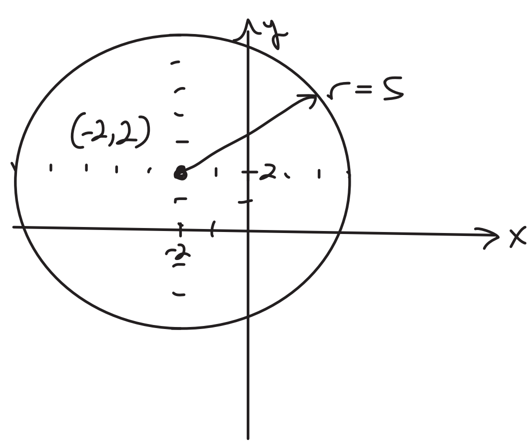


(d) $x^2+y^2+4(x-y)=17$

$x^2+4x+2^2+y^2-4y+2^2=17+4+4=25$ ← complete the square on x & y.

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

$\frac{(x+2)^2}{25}+\frac{(y-2)}{25}=1$ ← circle w/ center $(-2,2)$; $r=5$



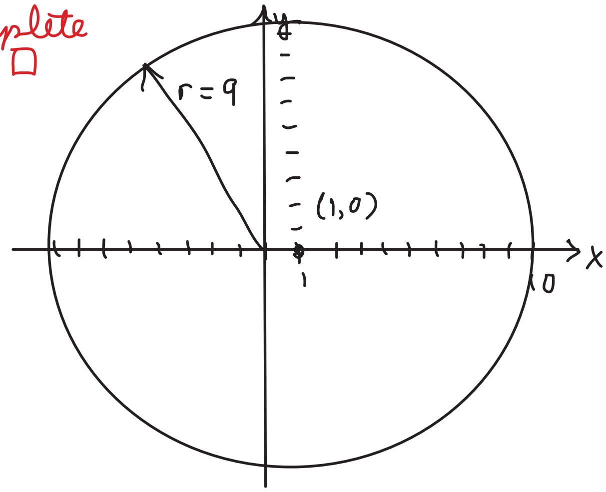
(5.) $x(x-2)+y^2=80$

$x^2-2x+1^2+y^2=80+1 \leftarrow$ complete the $\square$

$(x-1)^2+y^2=81$

$\dfrac{(x-1)^2}{81}+\dfrac{y^2}{81}=1$

center @ $(1,0)$, radius $=9$ } circle.



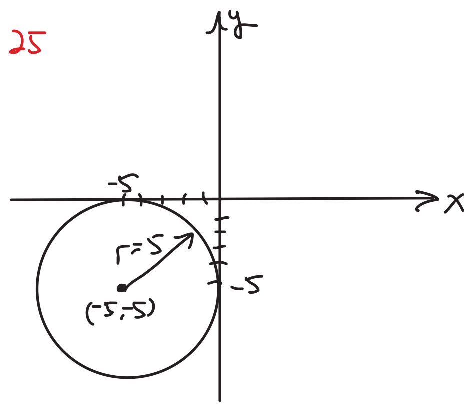
(6.) $x^2+y^2+10(x+y)=-25$

$x^2+10x+5^2+y^2+10y+5^2=\cancel{-25}+\cancel{25}+25$

$(x+5)^2+(y+5)^2=25$

$\dfrac{(x+5)^2}{25}+\dfrac{(y+5)^2}{25}=1$

center @ $(-5,-5)$; $r=5$
circle



(7.) $2x-y=7$ & $x^2+y^2=7 \leftarrow$ circle w/ ctr @ $(0,0)$; $r=\sqrt{7}$

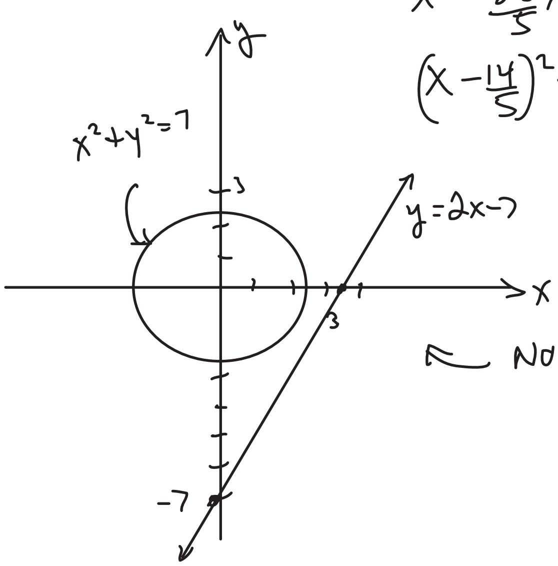
$y=2x-7 \rightarrow x^2+(2x-7)^2=7$

$x^2+4x^2-28x+49=7$

$5x^2-28x=-42$

$x^2-\frac{28}{5}x+\left(\frac{14}{5}\right)^2=\frac{-42}{5}+\frac{196}{25}-\frac{210}{25}=\frac{-14}{25}$

$\left(x-\frac{14}{5}\right)^2=\frac{-14}{25} \leftarrow$ we would take a square root of a number <0, so there are no $\mathbb{R}$ solutions $\Rightarrow$ no $\mathbb{R}$ intersections.



$\leftarrow$ No intersections – confirmed algebraically & graphically

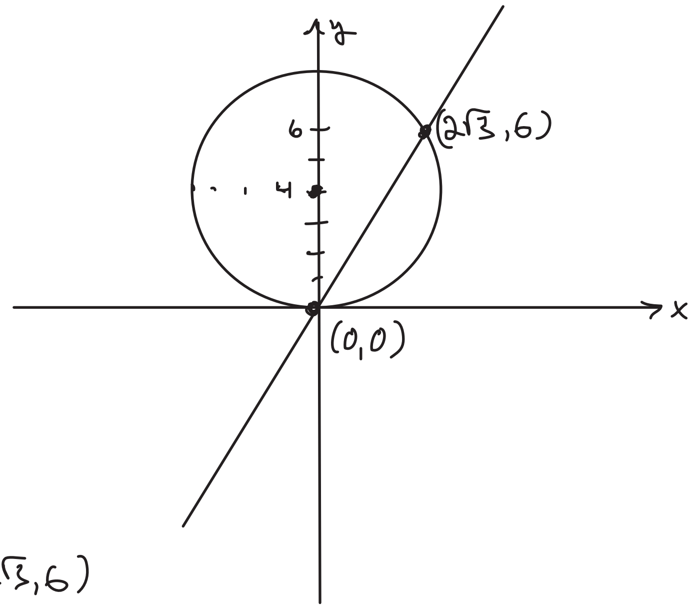
(3) $y = x\sqrt{3}$ $\quad x^2 + (y-4)^2 = 16$

$$x^2 + (x\sqrt{3} - 4)^2 = 16$$
$$x^2 + 3x^2 - 8x\sqrt{3} + \cancel{16} = \cancel{16}$$
$$4x^2 - 8x\sqrt{3} = 0$$
$$4x(x - 2\sqrt{3}) = 0$$

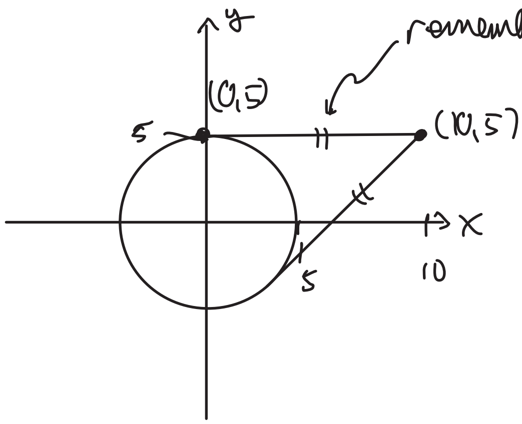
$x = 0$ $\quad x = 2\sqrt{3}$

@ $x=0$, $y = 0\sqrt{3} = 0 \rightarrow (0,0)$

@ $x = 2\sqrt{3}$ $y = 2\sqrt{3}\sqrt{3} = 2\cdot 3 = 6 \rightarrow (2\sqrt{3}, 6)$



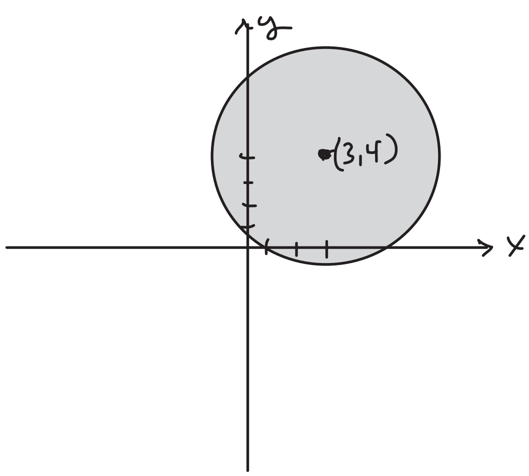
(4.) $x^2 + y^2 = 25 \leftarrow$ circle at $r = 5$ @ $(0,0)$



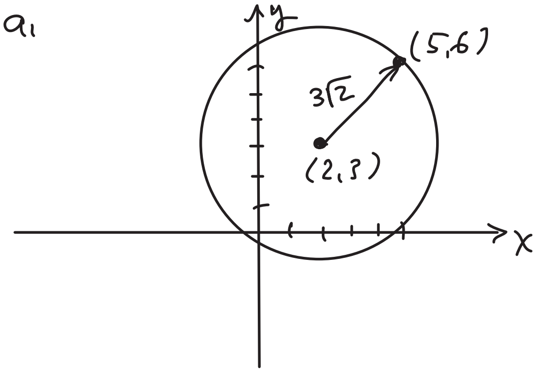
remember, geometry says these are $\cong$!

$$d = \left[(5-5)^2 + (10-0)^2\right]^{1/2}$$
$$= (0 + 100)^{1/2} = \sqrt{100} = 10$$

(5.) $(x-3)^2 + (y-4)^2 \le 25$ $\leftarrow$ set of all x, y that are <u>inside</u> or <u>on</u> the circle.



6a.



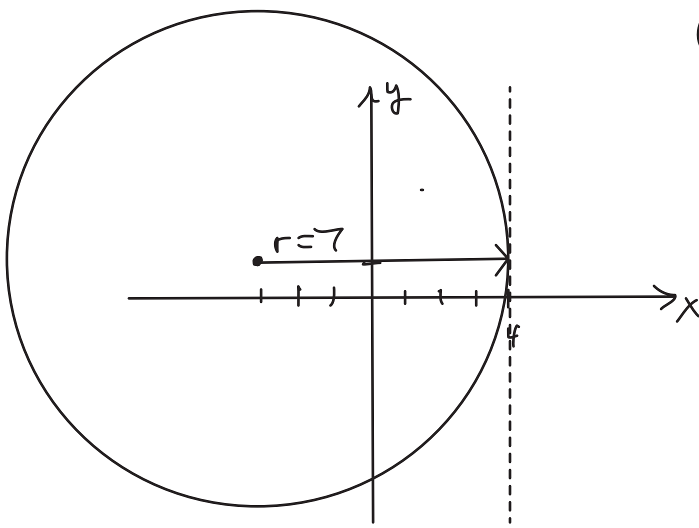
$$r^2 = \left[(5-2)^2 + (6-3)^2\right]^{1/2}$$
$$= (3^2 + 3^2)^{1/2}$$
$$= \sqrt{18} = 3\sqrt{2}$$

distance formula.

$$\boxed{\frac{(x-2)^2}{18} + \frac{(y-3)^2}{18} = 1}$$

6b. center @ (-3, 1) tangent $x = 4$

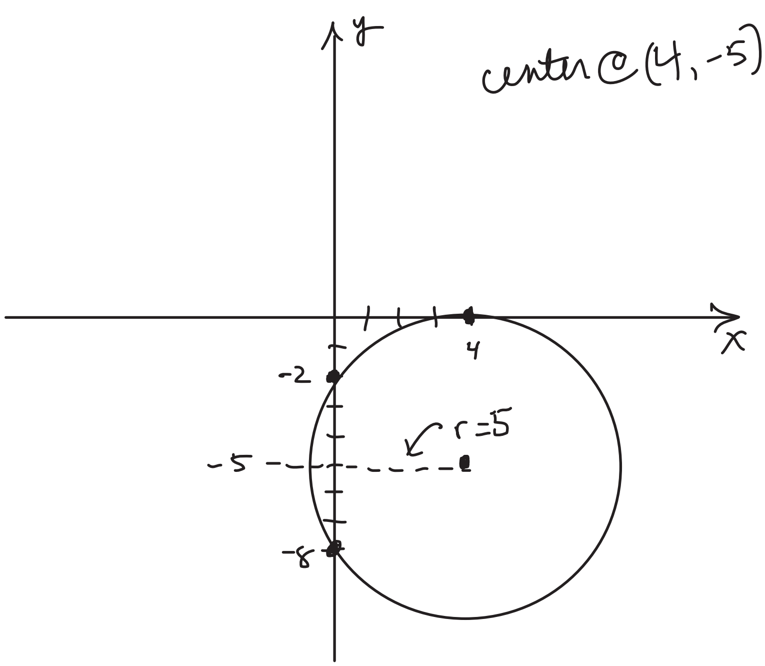
$$\frac{(x+3)^2}{49} + \frac{(y-1)^2}{49} = 1$$



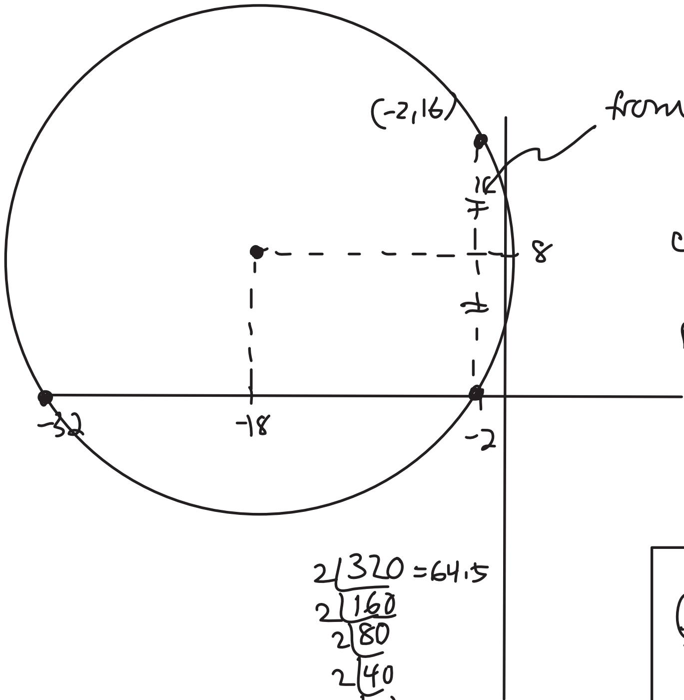
6c. tangent to x-axis @ (4,0), y-int @ -2, -8

center @ (4, -5)

$$\boxed{\frac{(x-4)^2}{25} + \frac{(y+5)^2}{25} = 1}$$



6. d. contains $(-2, 16)$; x-int, -2, -32



from geometry – a radius $\perp$ a chord bisects the chord.

center @ $(-18, 8)$

$$r^2 = \left[(16-8)^2 + (-18-(-2))^2\right]^{1/2}$$

$$= (8^2 + 16^2)^{1/2} = (64 + 256)^{1/2}$$

$$= (320)^{1/2} = 8\sqrt{5}$$

$$2 \,|\, 320 = 64 \cdot 5$$
$$2 \,|\, 160$$
$$2 \,|\, 80$$
$$2 \,|\, 40$$
$$2 \,|\, 20$$
$$2 \,|\, 10$$
$$5$$

$$\boxed{\frac{(x+18)^2}{320} + \frac{(x-8)^2}{320} = 1}$$