# Writing Circle and Ellipse Equations

| General parametric equation for an ellipse: | |
|---|---|
| (h, k) is center of the ellipse<br>a is the x-radius<br>b is the y-radius | $x = h + a\cos T$<br>$y = k + b\sin T$ |

* For Circle a = b

1. * Ellipse

x = 6 + 5cosT  center (6, -3)
y = -3 + 2sinT  x rad = 5  y rad = 2

$\left(\frac{x-6}{5}\right)^2 = (\cos T)^2$

$+ \quad \left(\frac{y+3}{2}\right)^2 = (\sin T)^2$

cartesian $\left(\frac{x-6}{5}\right)^2 + \left(\frac{y+3}{2}\right)^2 = 1$

2. * Circle

x = -1 + 4cosT  center (-1, 0)
y = 4sinT  x rad = 4  y rad = 4

$\left(\frac{x+1}{4}\right)^2 = (\cos T)^2$

$+ \quad \left(\frac{y}{4}\right)^2 = (\sin T)^2$

$\left(\frac{x+1}{4}\right)^2 + \left(\frac{y}{4}\right)^2 = 1$

Write parametric equations.

3. $\left(\frac{x-2}{5}\right)^2 + \left(\frac{y-4}{2}\right)^2 = 1$

$x = 2 + 5\cos T$
$y = 4 + 2\sin T$

4. $\left(\frac{x-6}{3}\right)^2 + \left(\frac{y+1}{3}\right)^2 = 1$

$x = 6 + 3\cos T$
$y = -1 + 3\sin T$

| Circle equation when a=b and $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$ | Ellipse equation $a$ is major radius and $b$ is minor radius $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$ |
|---|---|

Write a Cartesian equation that satisfies each set of conditions.

5. circle with center (8, -3) radius = 6

$\left(\frac{x-8}{6}\right)^2 + \left(\frac{y+3}{6}\right)^2 = 1$ or $(x-8)^2 + (y+3)^2 = 36$

6. circle with center (-5, 2), passes through (-9, 6)

$(x-h)^2 + (y-k)^2 = r^2$
$(-9+5)^2 + (6-2)^2 = r^2$
$16 + 16 = r^2$
$\sqrt{32} = r$
$4\sqrt{2} = r$

$\left(\frac{x+5}{\sqrt{32}}\right)^2 + \left(\frac{y-2}{\sqrt{32}}\right)^2 = 1$

OR

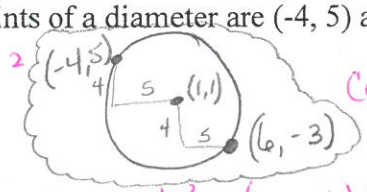
$(x+5)^2 + (y-2)^2 = 32$

7. circle whose endpoints of a diameter are (-4, 5) and (6, -3)

$(-4-1)^2+(5-1)^2=r^2$

$25+16=r^2$

$\sqrt{41}=r$

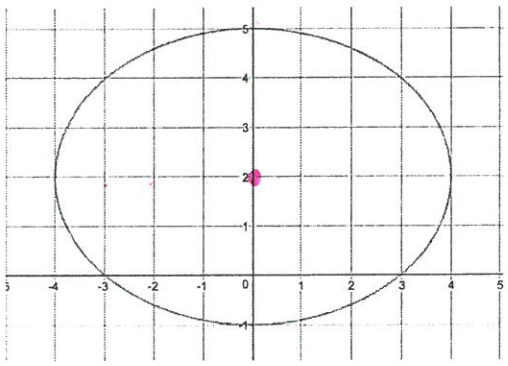



Center $\rightarrow \left(\frac{-4+6}{2}, \frac{5-3}{2}\right) = (1,1)$

$\left(\frac{x-1}{\sqrt{41}}\right)^2+\left(\frac{y-1}{\sqrt{41}}\right)^2=1$ $\quad (x-1)^2+(y-1)^2=41$

Write the equation

8.



center $(0,2)$

x rad = 4

y rad = 3

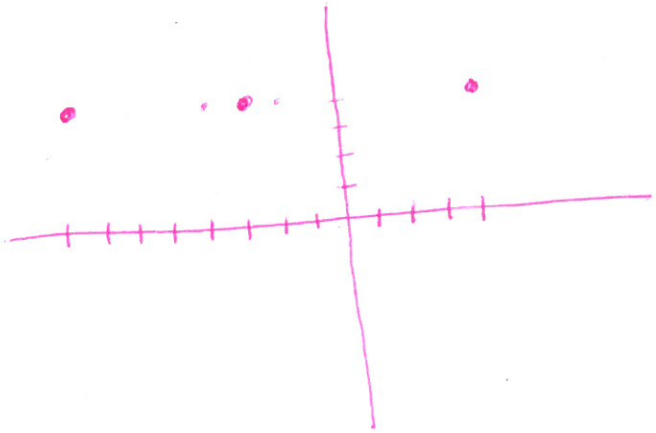
$\left(\frac{x-0}{4}\right)^2+\left(\frac{y-2}{3}\right)^2=1$

OR

$x = 4\cos T$

$y = 2+3\sin T$

9. ellipse whose endpoints of major axis are (-8, 4) and (4, 4), foci at (-3, 4) and (-1, 4)



$\frac{-8+4}{2} = -2$ center $(-2,4)$

$a = 6$ $\quad a^2=b^2+c^2$

$c = 1$ $\quad 36-1=b^2$ $\quad b=\sqrt{35}$

$\left(\frac{x+2}{6}\right)^2+\left(\frac{y-4}{\sqrt{35}}\right)=1$