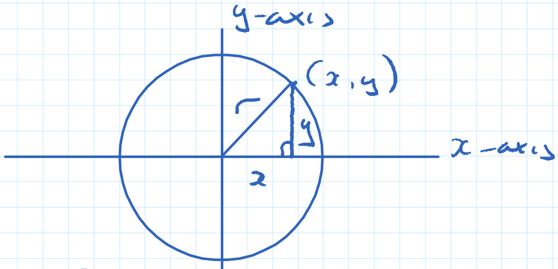
Circle centre (0,0)



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

Write down centre and radius of

(i) $x^2+y^2=25$ Centre (0,0) $r=5$

(ii) $x^2+y^2=40$ Centre (0,0) $r=\sqrt{40}$
$=2\sqrt{10}$

(iii) $5x^2+5y^2=9$

$x^2+y^2=\frac{9}{5}$ Centre (0,0)

Point inside, on or outside a Circle.

Is $(-3,7)$ inside, on or outside $x^2+y^2=47$.

$(-3)^2+7^2$

$9+49$

$58>47 \Rightarrow$ outside

Sub in point

Ans $< r^2 \Rightarrow$ inside

Ans $= r^2 \Rightarrow$ on

Ans $> r^2 \Rightarrow$ outside

$(2,k)$ is inside $x^2+y^2=29$.

Find range of values for k.

Centre (0,0)
$r=\sqrt{29}$

$2^2+k^2<29$

$4+k^2<29$

$k^2<25$

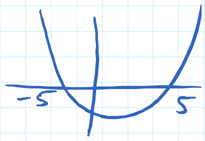
$k^2-25<0$

$k^2 - 25 = 0$

$k^2 = 25$

$k = \pm 5$

$-5 < k < 5$



Name 3 points inside $x^2+y^2=9$

$x^2+y^2=9$ Centre $(0,0)$

$(1,0)$ $(0,1)$ $(2,0)$ $r=3$

Cuts axes.

Find where $x^2+y^2=64$ cuts the x-axis.

x-axis $y=0$

$x^2=64$

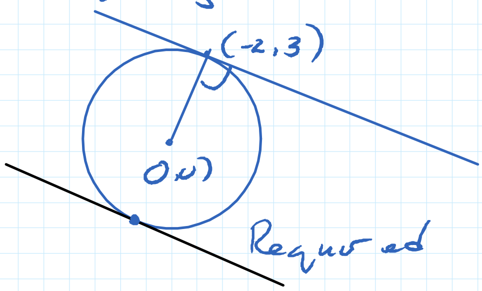
$x = \pm 8$ $(8,0)$ $(-8,0)$

Tangent at a point.

Find tangent to $x^2+y^2=13$ at point $(-2,3)$. Find parallel tangent.

$x^2+y^2=13$ Centre $(0,0)$

$r = \sqrt{13}$



$(0,0)$ $(-2,3)$

$m = \frac{3}{-2}$

Required $m = \frac{2}{3}$

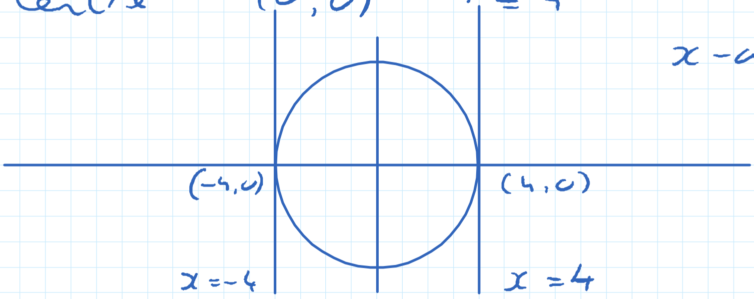
$y - 3 = \frac{2}{3}(x+2)$

$(-2,3) \Rightarrow (0,0) \Rightarrow (2,-3)$

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

Find where $x^2+y^2=16$ cuts the x-axis. State the tangent at these points

Centre $(0,0)$ $r=4$



x-axis $y=0$

$x^2=16$

$x = \pm 4$

Tangents from outside a circle

Find tangents from $(1,3)$ to

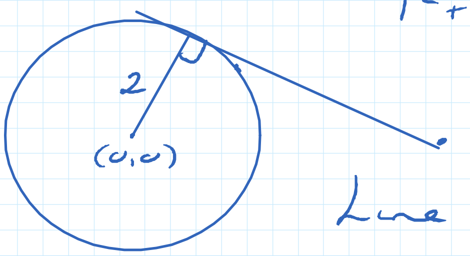
$x^2+y^2=4.$

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

$(2,0)$ $(-2,0)$

$1^2+3^2=10>4$

$\Rightarrow$ outside



Line $\Rightarrow$

$y-y_1=m(x-x_1)$

$y-3=m(x-1)$

Perpendicular distance from $y-3=m(x-1)$ to $(0,0)$ is 2.

$$\frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$$

$y-3=mx-m$

$mx-y+3-m=0$ $(0,0)$

$a=m$ $b=-1$ $c=3-m$ $x_1=0$ $y_1=0$

$$\frac{|3-m|}{\sqrt{m^2+1}}=2$$

$|3-m|=2\sqrt{m^2+1}$

$(3-m)^2=4(m^2+1)$

$9-6m+m^2=4m^2+4$

$3m^2+6m-5=0$

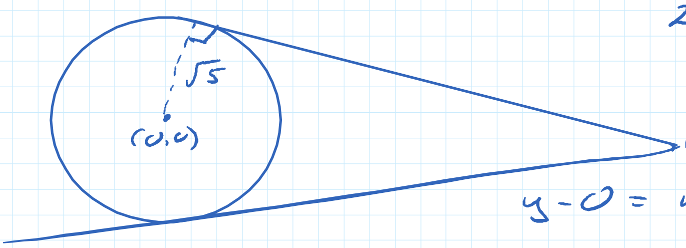
$$\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

Find tangents to $x^2+y^2=5$ from the point $(5,0)$

Centre $(0,0)$ $r=\sqrt{5}$

$25>5$

$\Rightarrow$ outside



$y-0=m(x-5)$

$$y = mx - 5m$$

$$mx - y - 5m = 0$$

$a = m \quad b = -1 \quad c = -5m \quad x_1 = 0 \quad y_1 = 0$

$$\frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}} =$$

$$\frac{|-5m|}{\sqrt{m^2+1}} = \sqrt{5}$$

$$|-5m| = \sqrt{5}\sqrt{m^2+1}$$

$$25m^2 = 5(m^2+1)$$

$$25m^2 = 5m^2 + 5$$

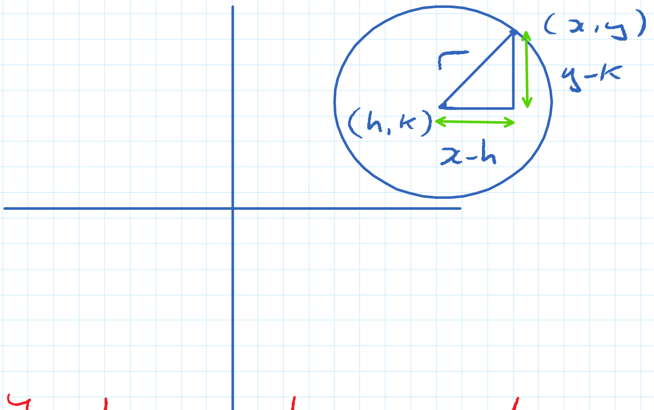
$$20m^2 = 5$$

$$m^2 = \frac{1}{4}$$

$$m = \pm \frac{1}{2}$$

$y = \frac{1}{2}(x-5)$ or $y = -\frac{1}{2}(x-5)$

Circle centre (h, k)



$$(x-h)^2 + (y-k)^2 = r^2$$

Find centre and radius of

(i) $(x-3)^2 + (y-5)^2 = 36$

Centre $(3, 5)$ $r = 6$

(ii) $(x+5)^2 + (y-7)^2 = 49$

Centre $(-5, 7)$ $r = 7$

(iii) $x^2 + (y-2)^2 = 8$ Centre $(0,0)$

$r = \sqrt{8}$

$(x-3)^2+(y+1)^2=K$. Given $(2,-3)$ is on circle. Find

(i) K.

(ii) Tangent at $(2,-3)$

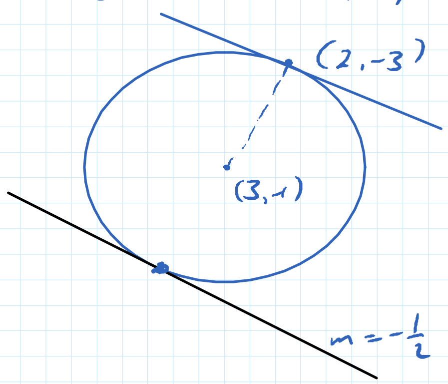
(iii) Parallel tangent.

$(2,-3)$ $\qquad (2-3)^2+(-3+1)^2=k$

$x \quad y$

$k=5$

Centre $(3,-1)$ $\qquad r=\sqrt{5}$



$(2,-3) \quad (3,-1)$

$$m=\frac{-1+3}{3-2}=2$$

Required $m=-\frac{1}{2}$

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

$(2,-3) \Rightarrow (3,-1) \Rightarrow (4,1)$

$$y-1=-\frac{1}{2}(x-4)$$

Find where $(x-3)^2+(y+1)^2=25$ cuts the y-axis.

y-axis $\qquad x=0$

$$(-3)^2+(y+1)^2=25$$

$$9+(y+1)^2=25$$

$$(y+1)^2=16$$

$y+1=4 \qquad\qquad y+1=-4$

$y=3 \qquad\qquad y=-5$.