

Circle + Linear Equations.

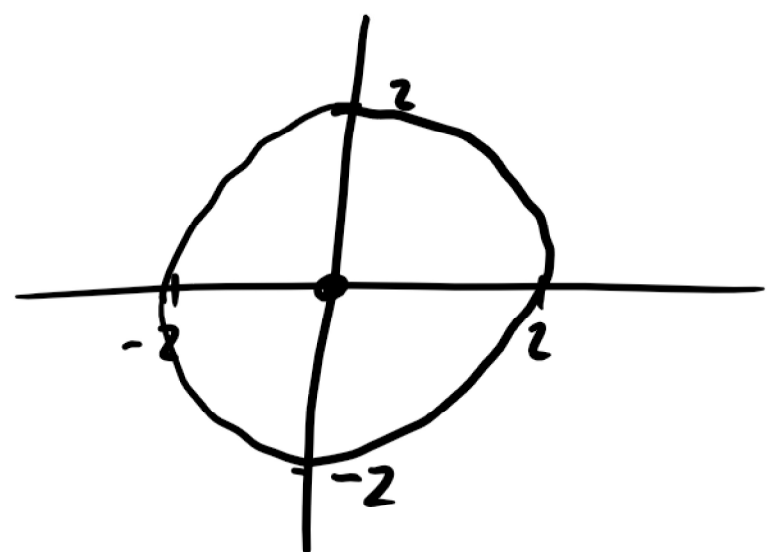
Circle equation $x^2 + y^2 = r^2$

Centre (0,0)

r = radius

$x^2 + y^2 = 4$

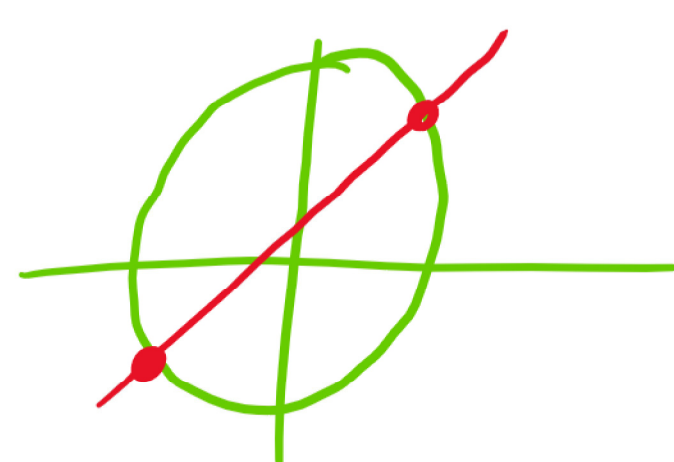
(0,0) r = 2



Linear Equation

$ax + by + c = 0$

$y = mx + c$



Method to find the points of intersections

- ① Rearrange the linear equation in terms of either x or y. Pick the variable with no coefficient
- ② Substitute the rearrange linear equation into the corresponding variable in the circle equation.
- ③ Tidy up - expand brackets, add/subtract like terms - will form a quadratic
- ④ Solve the quadratic equation for two values.
- ⑤ Sub the values of the quadratic back into the rearranged linear equation to find the missing variables.

Solve the equations

① $x^2 + y^2 = 5$ Circle
 $x + y = 3$ Line

$x + y = 3$ ① in terms x
 $x = -y + 3$
in terms y
 $y = -x + 3$

② substitution
 $x = -y + 3$ sub into circle $(-y + 3)^2 + y^2 = 5$

③ Tidy up.
 $(-y + 3)(-y + 3) + y^2 - 5 = 0$
 $-y(-y + 3) + 3(-y + 3) + y^2 - 5 = 0$
 $y^2 - 3y - 3y + 9 + y^2 - 5 = 0$
 $2y^2 - 6y + 4 = 0$ HCF $\div 2$
 $y^2 - 3y + 2 = 0$ Quadratic Equations.

④ Solve quadratic
 $y^2 - 3y + 2 = 0$
 $(y - 1)(y - 2) = 0$
 $y - 1 = 0$ $y - 2 = 0$
 $y = 1$ $y = 2$

⑤ $x = -y + 3$ sub values back in
 $y = 1$ $y = 2$
 $x = -(1) + 3$ $x = -(2) + 3$
 $x = 2$ $x = 1$
 $(2, 1)$ $(1, 2)$
Points of intersection

HW pg 34 Q 2 + 3

② $x^2 + y^2 = 10$
 $x - y = 4$
 $x = y + 4$

$(y + 4)^2 + y^2 - 10 = 0$
 $y(y + 4) + 4(y + 4) + y^2 - 10 = 0$
 $y^2 + 4y + 4y + 16 + y^2 - 10 = 0$
 $2y^2 + 8y + 6 = 0$ HCF = 2
 $y^2 + 4y + 3 = 0$ Quadratic
 $(y + 3)(y + 1) = 0$
 $y + 3 = 0$ $y + 1 = 0$
 $y = -3$ $y = -1$

$x = y + 4$
 $x = (-3) + 4$ $x = (-1) + 4$
 $x = +1$ $x = +3$
 $(1, -3)$ $(3, -1)$

③ $x^2 + y^2 = 18$
 $x - y = 0$
 $x = y$