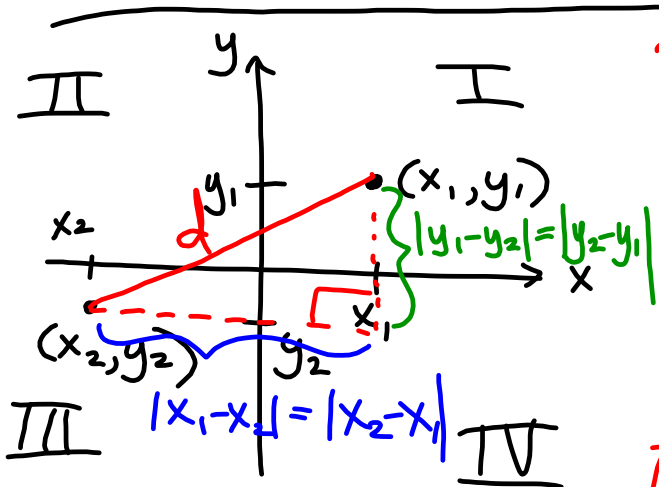
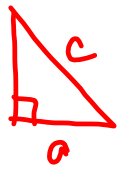
# Distance between 2 Points




Pythagorean Theorem




$a^2+b^2=c^2$

$d^2=(x_2-x_1)^2+(y_2-y_1)^2$

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

Memorize

Find distance between $(2,-3)$ & $(5,-1)$.

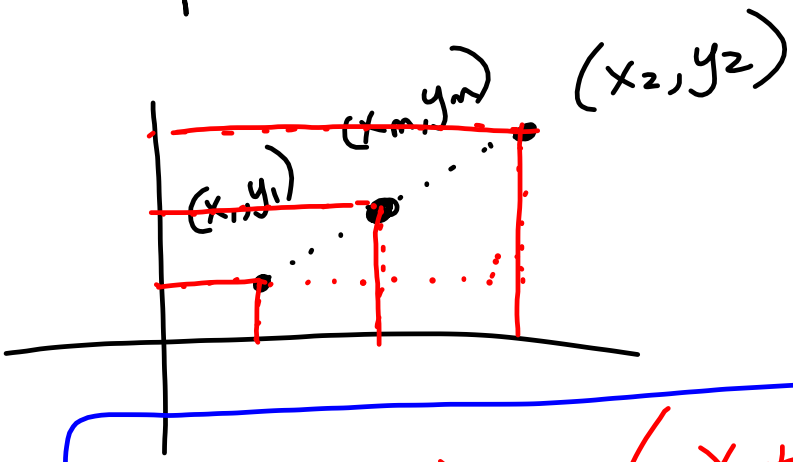
$x_1\ y_1$ $x_2\ y_2$

$$d=\sqrt{(-1-(-3))^2+(-5-2)^2}$$

$$=\sqrt{2^2+(-7)^2}=\sqrt{4+49}=\sqrt{53}$$

$$\sqrt{32}=\sqrt{16\cdot 2}=\sqrt{16}\cdot\sqrt{2}=4\sqrt{2}$$

# Midpoint




$$(x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Find the midpoint between $(2,-3)$ & $(-1,5)$.

$$(x_m, y_m) = \left(\frac{2+(-1)}{2}, \frac{-3+5}{2}\right)$$

$$= \boxed{\left(\frac{1}{2}, 1\right)}$$

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$(3,-1)$ is the midpoint between $(5,-5)$ and what other point?

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

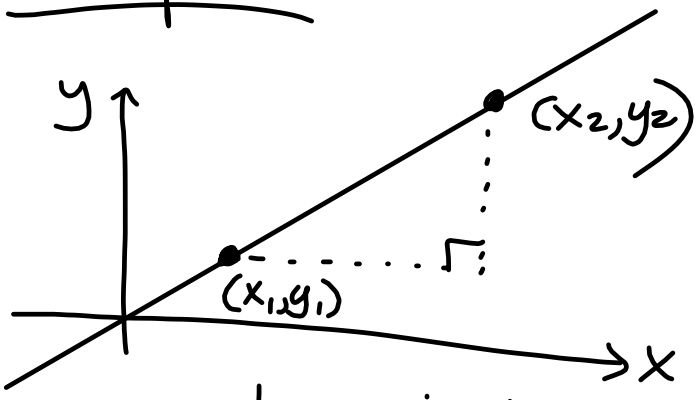
$$3 = \frac{5+x}{2} \qquad -1 = \frac{-5+y}{2}$$

$$6 = 5 + x \qquad -2 = -5 + y$$

$$1 = x \qquad 3 = y$$

$$\boxed{(1,3)}$$

# Slope




$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x}$$

$$= \frac{\text{rise}}{\text{run}} = \boxed{\frac{y_2 - y_1}{x_2 - x_1} = m}$$

Find the slope of the line containing $(3, -4)$ and $(-7, -1)$.

$$m = \frac{\Delta y}{\Delta x} = \frac{-4-(-1)}{3-(-7)} = \boxed{\frac{-3}{10}}$$

$$= \frac{-1-(-4)}{-7-3} = \frac{3}{-10} = -\frac{3}{10}$$

**Standard Form:** $Ax+By=C$

$A, B, C$ - real #'d constants

**Slope-Intercept Form:**

$y=mx+b$, $m, b$ = real # constants

$m$ = slope $= \frac{\Delta y}{\Delta x}$ ; $b$ = y-intercept (point $(0,b)$ where the line crosses the y-axis)

**Point-Slope Form:**

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

$(x_1, y_1)$ is a point on the line

$m$ = slope

Find the equation of a line that passes through the points. $(-3,5)$ and $(4,1)$.

$x_1, y_1$

$$m=\frac{\Delta y}{\Delta x}=\frac{5-1}{-3-4}=\frac{4}{-7}=-\frac{4}{7}$$

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

$$y-1=-\frac{4}{7}(x-4)$$

$$y-1=-\frac{4}{7}x+\frac{16}{7}$$

$$y=-\frac{4}{7}x+\frac{16}{7}+1\cdot\frac{7}{7}$$

$$y=-\frac{4}{7}x+\frac{23}{7}$$

↑ slope-intercept equation