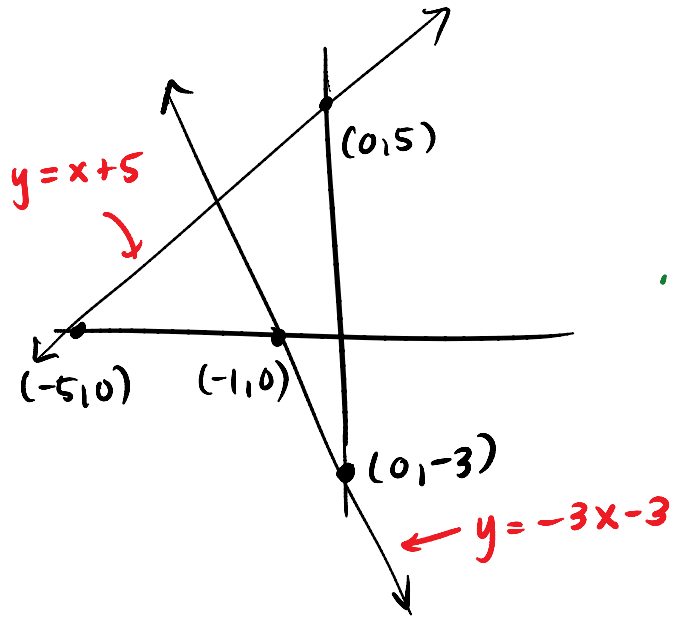
Sec 13.3
pgs. 620 - 621
#5 - 12,
14, 15

#5 Where does $\overleftrightarrow{DE}$ intersect $\overleftrightarrow{FH}$?



$y = x+5$
$y = -3x-3$

$x+5 = -3x-3$
$4x = -8$
$x = -2$

$\boxed{(-2,3)}$

#6 Find the intersection of the graphs of
$x = a$ and $3x + 2y = 12$

$\boxed{(a, -1.5a+6)}$

$2y = -3x+12$
$y = \frac{-3}{2}x + 6$
$y = -1.5a+6$

#7 Show that the graphs are CONCURRENT

a. $2x+3y=2$
b. $y = 2x-10$
c. $3x-y=14$

a + b

$2x+3(2x-10)=2$
$2x+6x-30=2$
$8x=32$
$x=4$
$y=-2$
$(4,-2)$

a + c

$2x+3y=2 \Rightarrow 2x+3y=2$
$3(3x-y=14) \Rightarrow 9x-3y=42$
$11x = 44$
$x=4$
$y=-2$
$(4,-2)$

b + c ← show algebraically like above.

$\boxed{(4,-2)}$

#8 The graph of $x^2+y^2=25$ is a circle
The graph of $x^2-y^2=7$ is a hyperbola

Find the intersection

$$x^2+y^2=25$$
$$x^2-y^2=7$$
$$2x^2=32$$
$$x^2=16$$
$$x=\pm 4$$

$$4^2+y^2=25$$
$$16+y^2=25$$
$$y^2=9$$
$$y=\pm 3$$
$$\boxed{\begin{matrix}(4,-3)\\(4,3)\end{matrix}}$$

and

$$(-4)^2+y^2=25$$
$$16+y^2=25$$
$$y=\pm 3$$
$$\boxed{\begin{matrix}(-4,-3)\\(-4,3)\end{matrix}}$$

#9 Find, in point slope form, an equation of a line containing $(2,1)$ and the point of intersection of the graphs of $3x-y=3$ and $x+2y=15$

$$2(3x-y=3) = 6x-2y=6$$
$$x+2y=15 = x+2y=15$$
$$7x=21$$
$$x=3$$
$$y=6$$
$$(3,6)$$

$(3,6)$
$(2,1)$

$$m=\frac{6-1}{3-2}=\frac{5}{1}=5$$

$$\boxed{\begin{matrix}y-1=5(x-2)\\ \text{or}\\ y-6=5(x-3)\end{matrix}}$$

#10 Find an equation of the line that is parallel to the graph of $2x+3y=5$ and contains the point of intersection of the graphs of $y=4x+8$ and $y=x+5$

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

$$4x+8=x+5$$
$$3x=-3$$
$$x=-1$$
$$y=4$$
$$(-1,4)$$

$$\boxed{y-4=-\frac{2}{3}(x+1)}$$

#11 Find the point of intersection of the graphs of

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

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

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

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

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

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

$\frac{4}{2}x=\frac{-4}{2}$

$x=-1$

$y=2$

$\boxed{(-1,2)}$

#12 Consider the line corresponding to $y=2x+1$
Line 2 contains $(5,3)$ and is parallel to the given line
Line 3 contains $(5,16)$ and has the same y-int as the given line
Find the intersection of lines 2 and 3

Line 2. $m=2$

$y-3=2(x-5)$

$y-3=2x-10$

$y=2x-7$

Line 3: yint: $(0,1)$ $(5,16)$

$m=\frac{16-1}{5-0}=\frac{15}{5}$

$m=3$

$y-1=3(x-0)$

$y=3x+1$

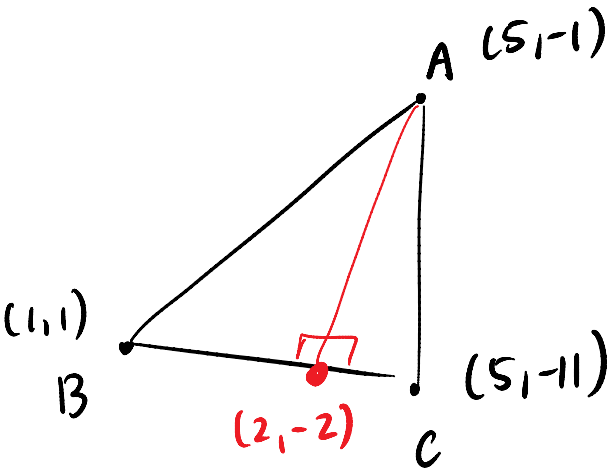
$2x-7=3x+1$

$-8=x$

$y=-23$

$\boxed{(-8,-23)}$

#14 In ΔABC, $A = (5,-1)$ $B = (1,1)$ and $C = (5,-11)$
Find the length of the altitude from A to $\overline{BC}$



$m_{BC} = \frac{1+11}{1-5} = \frac{12}{-4} = -3$

$\perp m = \frac{1}{3}$

EQUATION OF alt: $y+1 = \frac{1}{3}(x-5)$

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

$y = \frac{1}{3}x - \frac{8}{3}$

EQUATION of $\overline{BC}$ $y-1 = -3(x-1)$

$y-1 = -3x+3$

$y = -3x+4$

$\frac{1}{3}x - \frac{8}{3} = -3x+4$

$\frac{3}{10} \cdot \frac{10}{3}x = \frac{20}{3} \cdot \frac{3}{10}$

$x = 2$ $(2,-2)$

$y = -2$

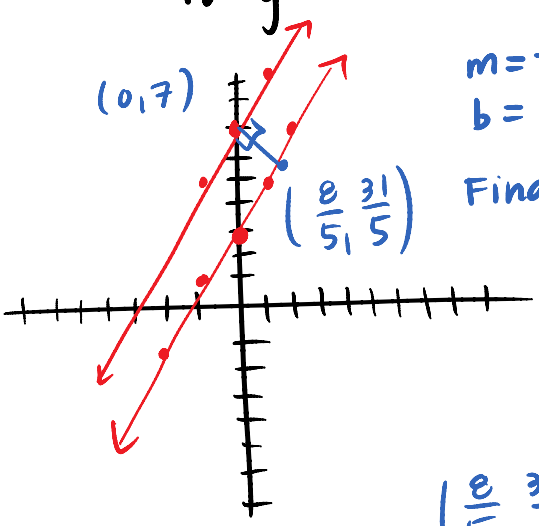
$d = \sqrt{(5-2)^2 + (-1+2)^2}$

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

$d = \sqrt{9+1}$

$\boxed{d = \sqrt{10}}$

#15 Find the distance between the parallel lines corresponding to $y = 2x+3$ and $y = 2x+7$.



$m = -\frac{1}{2}$ $y = -\frac{1}{2}x + 7$

$b = 7$

Find P.O.I.

$y = \frac{1}{2}x + 7$

$y = 2x + 3$

$-\frac{1}{2}x + 7 = 2x + 3$

$\frac{2}{5} \cdot 4 = \frac{5}{2}x \cdot \frac{2}{5}$

$\frac{8}{5} = x$

$\left(\frac{8}{5}, \frac{31}{5}\right)$

$d = \sqrt{\left(0 + \frac{8}{5}\right)^2 + \left(7 - \frac{31}{5}\right)^2}$

$d = \sqrt{\left(\frac{8}{5}\right)^2 + \left(\frac{4}{5}\right)^2}$

$d = \sqrt{\frac{64}{25} + \frac{16}{25}}$

$d = \sqrt{\frac{80}{25}} = \sqrt{\frac{16}{5}}$

$= \frac{4}{\sqrt{5}} = \boxed{\frac{4\sqrt{5}}{5}}$