

### 3.5 Equations of lines

point-slope form

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

OR

$$m = \frac{y - y_1}{x - x_1}$$

set up form

Slope intercept

$$y = mx + b$$

(solve for y)

Standard form

$$ax + by = c$$

$a > 0$

$a$  cannot be a fraction  
(get all  $x$  and  $y$  on same side)

Ex 1

write the equation of a line through  $(-4, 5)$  and  $(5, 3)$ . Write your answer in standard form.

goal:

point  $(-4, 5)$

slope

$$\begin{matrix} (-4, 5) \\ (5, 3) \end{matrix} \quad m = \frac{5-3}{-4-5} = \frac{-2}{-9} = -\frac{2}{9}$$

goal form:  $ax + by = c$

traditional

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

$$y - 5 = -\frac{2}{9}(x - (-4))$$

$$y - 5 = -\frac{2}{9}x - \frac{8}{9}$$

LCD  
9

$$\frac{2}{9}x + y = -\frac{8}{9} + 5$$

$$2x + 9y = -8 + 45$$

$$2x + 9y = 37$$

Proportion version

$$m = \frac{y - y_1}{x - x_1} \quad \left\{ \begin{array}{l} (x_1, y_1) \\ (-4, 5) \end{array} \right. \quad m = -\frac{2}{9}$$

goal:  
 $ax + by = c$

$$-\frac{2}{9} = \frac{y - 5}{x - 4} \rightarrow \frac{-2}{-9} = \frac{y - 5}{x + 4}$$

$$\begin{aligned} 2(x + 4) &= -9(y - 5) \\ 2x + 8 &= -9y + 45 \\ 2x + 9y &= 45 - 8 \\ \boxed{2x + 9y} &= \boxed{37} \end{aligned}$$

$$\begin{aligned} -\frac{2}{9} &= \frac{y - 5}{x + 4} \\ -2(x + 4) &= 9(y - 5) \\ -2x - 8 &= 9y - 45 \\ -2x - 9y &= -45 + 8 \\ -1 \quad -2x - 9y &= -37 \\ \boxed{1 \quad 2x + 9y} &= \boxed{37} \end{aligned}$$

$$\frac{a}{c} = \frac{b}{d}$$

$$ad = bc$$

Ex 2 write the equation of a line through  $(-5, 8)$  that is perpendicular to the line  $3x - 5y = 7$ . Write your answer in slope-intercept form

with:  $(-5, 8)$   
 slope:  $3x - 5y = 7$   
 $5y = -\frac{3}{5}x + 1$   
 $y = -\frac{3}{5}x + \frac{1}{5}$   
 $y = \frac{3}{5}x - \frac{7}{5}$

goal form:  $y = mx + b$

traditional

$$\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 8 &= -\frac{5}{3}(x - (-5)) \end{aligned}$$

$$y - 8 = -\frac{5}{3}x - \frac{25}{3}$$

$$\frac{-2 \cdot 3}{1 \cdot 5} = \frac{24}{3}$$

$$y = -\frac{5}{3}x - \frac{25}{3} + 8$$

$$y = -\frac{5}{3}x - \frac{15}{3} + \frac{24}{3}$$

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

needed:  $-\frac{5}{3}$

proportion  $n = \frac{y - y_1}{x - x_1}$

$$-\frac{5}{3} = \frac{y - 8}{x - (-5)}$$

$$-\frac{5}{3} = \frac{y - 8}{x + 5} \quad y = mx + b$$

$$2(y - 8) = -5(x + 5)$$

$$3y - 24 = -5x - 25$$

$$3y = -5x - 25 + 24$$

$$\begin{aligned} 2y &= -5x - 1 \\ y &= -\frac{5}{3}x - \frac{1}{3} \end{aligned}$$

Ex 3 write the equation of the line through  $(-5, -3)$  that is parallel to the line  $y = 5x + 2$ . Write your answer in standard form

point:  $(-5, -3)$

slope:  $y = 5x + 2$  //  
 $m = 5$

need same slope  
 $m = 5$ !

$$m = \frac{y - y_1}{x - x_1} \quad \frac{5}{1} = \frac{y - (-3)}{x - (-5)} \rightarrow \frac{5}{1} = \frac{y + 3}{x + 5}$$

goal format:  $ax + by = c$

$$5(x + 5) = 1(y + 3)$$

$$5x + 25 = y + 3$$

$$5x - y = 3 - 25$$

$$\boxed{5x - y = -22}$$

fractional

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

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

$$y + 3 = 5(x + 5)$$

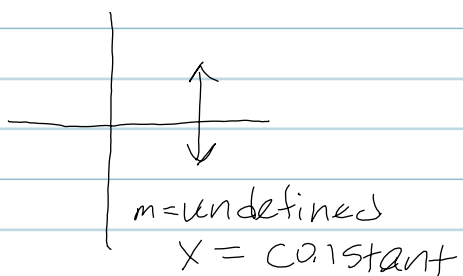
$$y + 3 = 5x + 25$$

$$-5x + y = 25 - 3$$

$$-5x + y = 22$$

$$\boxed{5x - y = -22}$$

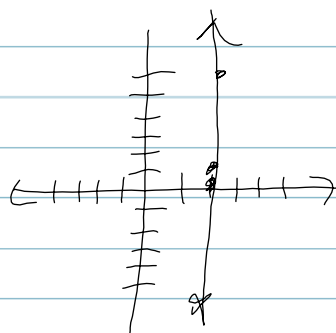
Ex 4 Write the equation of the vertical line through  $(-1, 6)$



$$x = -1$$

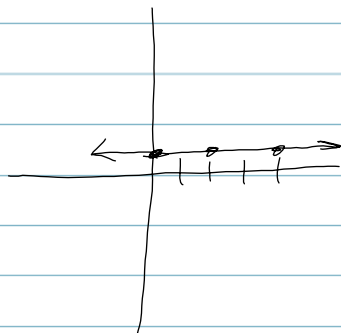
line  $x = 2$

x	y
2	6
2	1
2	0



$$y = 1$$

x	y
2	1
4	1
0	1



Ex 5 Write the equation of the horizontal line through  $(-5, -8)$

$$y = -8$$

Ex 6 Write the equation of the line through  $(-2, 5)$  that is parallel to the line  $x = 4$

// to  $x = 4$  (vertical)

$\Rightarrow$  vertical line through  $(-2, 5)$

$$x = -2$$

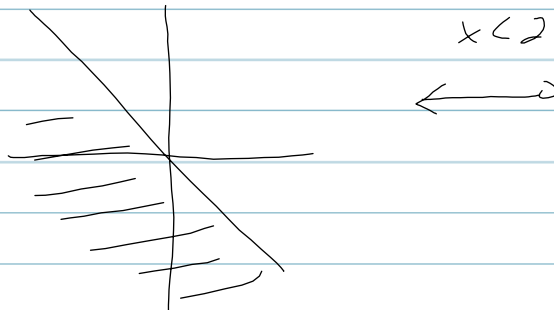
through  $(-4, 6) \perp$  to  $x=1$

horizontal line through  $(-4, 6)$   $y=6$

Section 3.7

$$x + 2y > 4$$

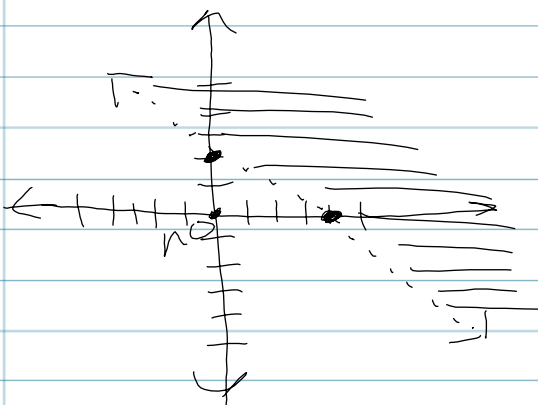
dotted.



① graph as if it is =

x	y
0	2
4	0

② decide dotted or solid line  
( $<$  or  $>$ ) ( $\leq$  or  $\geq$ )



③ decide which part to shade  
(test point not on line)

$(0, 0)$

$$\begin{aligned}x + 2y &> 4 \\ 0 + 2(0) &> 4 \\ 0 &> 4 \\ \text{no}\end{aligned}$$

## Test 3

grids

slope  $(H, K)$  a etc.

4 fn questions

sq. root fn.

L/R

D/R

3pts apiece

show work

plot points

2 - create graphs (line graphs)

intercepts

slope (2pts and line)

equations of lines - 2

//  $\perp$  or neither

graph inequality

domain / range (fns.)

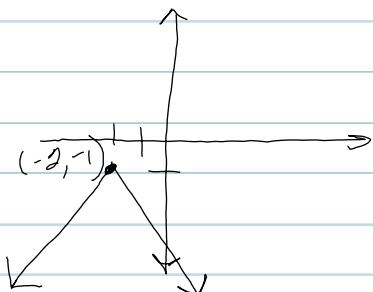
- ordered pairs (no repeat x's)

- equation ( $y^2$ )

find  $f(3)$

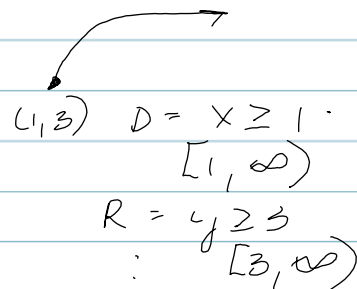
formula / graph find  $f(2)$

D/R graphs



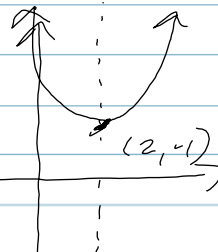
$D: (-\infty, \infty)$

$R: (-\infty, -1]$



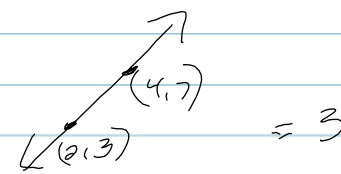
$(1, 3) \quad D = x \geq 1$   
 $[1, \infty)$

$R = y \geq 3$   
 $[3, \infty)$



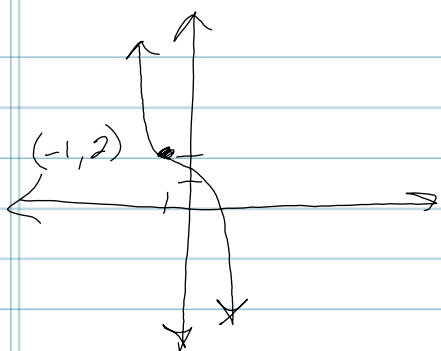
$D = (-\infty, \infty)$

$R = y \geq 4$   
 $[4, \infty)$



$(x, f(x))$

$= 3$



$$D: \mathbb{R} \quad (-\infty, \infty)$$

$$R: \mathbb{R}$$

graph (parabola)  
(square root)

word problem (linear)  
piece-wise find  $f(x)$  identify only

$$f(x) = \underset{\text{cost}}{\text{variable}} + \underset{\text{cost}}{\text{fixed}}$$

$$f(x) = 4x + 2$$

12 miles

$$4(12) + 2 = \$50$$

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2 - no worked out answers (mult-choice section)

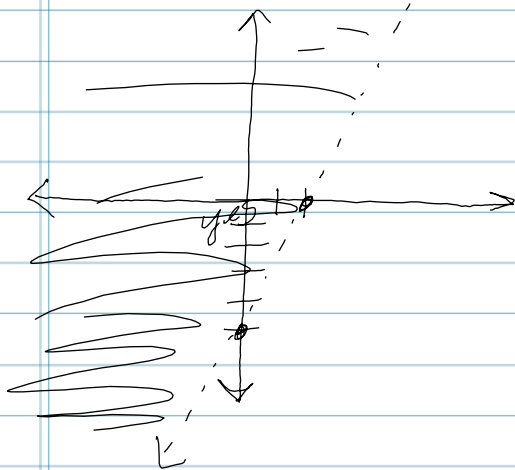
Lial

practise all about lines - solutions

practise fns / parabola / family of fns - solns

fns and their graphs - 9 wks.

$$5x - 2y < 10$$



x	y
0	-5
2	0

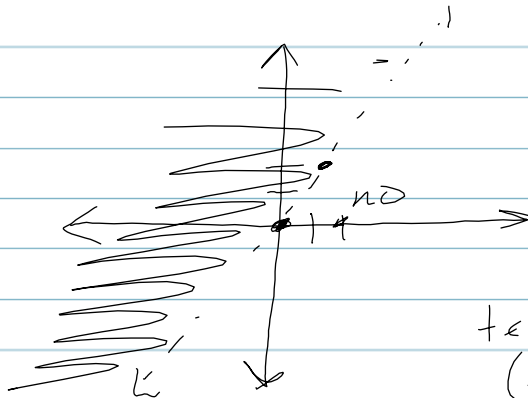
dotted

test (0, 0)  
 $5(0) - 2(0) < 10$   
 $0 < 10$   
yes

test (4, 1)  
 $5(4) - 2(1) < 10$   
 $20 - 2 < 10$   
 $18 < 10$   
no

~~y < 2x~~  $y > 2x$

x	y
0	0
1	2



test  
(2, 0)

$0 > 2(2)$   
 $0 > 4$   
no