

MTH030 Review for Test 1 Solutions

①

① a) $7x + 2 = x - 16$

$$\begin{array}{r} -x \qquad -x \\ 6x + 2 = -16 \\ -2 \quad -2 \\ \hline 6x = -18 \\ \hline 6 \quad 6 \end{array}$$

$$\boxed{x = -3}$$

b) $2(x+9) - x = 36$

$$\begin{array}{r} (2x) + 18 - x = 36 \\ x + 18 = 36 \\ -18 \quad -18 \end{array}$$

$$\boxed{x = 18}$$

c) $\left(\frac{3}{3}\right)\frac{5}{6}x - \left(\frac{2}{2}\right)\frac{4}{9}x = -\frac{2}{3}\left(\frac{6}{6}\right)$

LCD=18

$$\frac{15}{18}x - \frac{8}{18}x = -\frac{12}{18}$$

$$\frac{15x - 8x}{18} = -\frac{12}{18}$$

$$\left(\frac{18}{1}\right) \frac{7x}{18} = -\frac{12}{18} \left(\frac{18}{1}\right)$$

$$\frac{7x}{7} = -\frac{12}{7}$$

$$\boxed{x = -\frac{12}{7}}$$

d) $\left(\frac{5}{5}\right)\frac{x}{3} - \left(\frac{3}{3}\right)\frac{(x-5)}{5} = 7\left(\frac{15}{15}\right)$

LCD=15

$$\frac{5x}{15} - \frac{3(x-5)}{15} = \frac{105}{15}$$

$$\frac{5x - 3(x-5)}{15} = \frac{105}{15}$$

$$\frac{5x - 3x + 15}{15} = \frac{105}{15}$$

$$\left(\frac{15}{1}\right) \frac{2x + 15}{15} = \frac{105}{15} \left(\frac{15}{1}\right)$$

$$2x + 15 = 105$$

$$-15 \quad -15$$

$$\frac{2x}{2} = \frac{90}{2}$$

$$\boxed{x = 45}$$

② a) $\frac{I}{Pr} = \frac{Prt}{Pr}$

$$\boxed{\frac{I}{Pr} = t}$$

b) $3x - 5y = 11$
 $\quad \quad \quad +5y \quad +5y$

$$\frac{3x}{3} = \frac{11 + 5y}{3}$$

$$\boxed{x = \frac{11 + 5y}{3}}$$

or

$$\boxed{x = \frac{11}{3} + \frac{5y}{3}}$$

$$c) F = \frac{9}{5}C + 32$$

$$\begin{array}{r} -32 \\ -32 \end{array}$$

$$\left(\frac{5}{1}\right)(F-32) = \frac{9}{5}C \left(\frac{5}{9}\right)$$

$$\frac{5(F-32)}{9} = C$$

$$\boxed{\frac{5F - 160}{9} = C}$$

$$d) 5x + 4y = 8$$

$$\begin{array}{r} -5x \\ -5x \end{array}$$

$$\frac{4y}{4} = \frac{8-5x}{4}$$

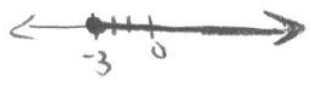
$$y = \frac{8-5x}{4}$$

$$y = \frac{8}{4} - \frac{5}{4}x$$

$$\boxed{y = 2 - \frac{5}{4}x}$$

same as $\boxed{y = -\frac{5}{4}x + 2}$

3) a) $x \geq -3$

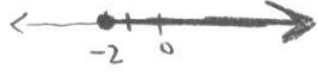


$$[-3, \infty)$$

b) $y + 5 \geq 3$

$$\begin{array}{r} -5 \\ -5 \end{array}$$

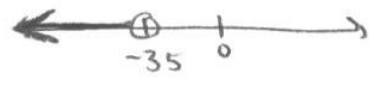
$$y \geq -2$$



$$[-2, \infty)$$

c) $\left(\frac{-5}{1}\right) - \frac{1}{5}y > 7 \left(\frac{-5}{1}\right)$

$$y < -35$$



$$(-\infty, -35)$$

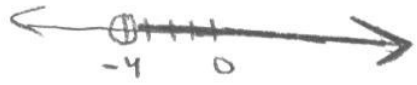
d) $2(1-y) - 4 < 6$

$$2 - 2y - 4 < 6$$

$$\begin{array}{r} -2 - 2y < 6 \\ +2 \quad +2 \end{array}$$

$$\frac{-2y}{-2} < \frac{8}{-2}$$

$$y > -4$$



$$(-4, \infty)$$

e) $5(x+1) \leq 3x+1$

$$5x + 5 \leq 3x + 1$$

$$\begin{array}{r} -3x \\ -3x \end{array}$$

$$2x + 5 \leq 1$$

$$\begin{array}{r} -5 \\ -5 \end{array}$$

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

$$x \leq -2$$



$$(-\infty, -2]$$

4. a) $|2x+1| = 3$

$$\begin{array}{r} 2x+1 = 3 \\ \underline{-1} \quad \underline{-1} \end{array}$$

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

$$\boxed{x = 1}$$

$$\begin{array}{r} 2x+1 = -3 \\ \underline{-1} \quad \underline{-1} \end{array}$$

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

$$\boxed{x = -2}$$

b) $|2y| = -10$

no solution!
absolute value
of anything can
NEVER be negative
since abs. value is
a length

c) $\left| \frac{3y-1}{2} \right| = 8$

$\left(\frac{2}{1} \right) \frac{3y-1}{2} = 8 \left(\frac{2}{1} \right)$

$$\begin{array}{r} 3y-1 = 16 \\ \underline{+1} \quad \underline{+1} \end{array}$$

$$\frac{3y}{3} = \frac{17}{3}$$

$$\boxed{y = \frac{17}{3}}$$

$\left(\frac{2}{1} \right) \frac{3y-1}{2} = -8 \left(\frac{2}{1} \right)$

$$\begin{array}{r} 3y-1 = -16 \\ \underline{+1} \quad \underline{+1} \end{array}$$

$$\frac{3y}{3} = \frac{-15}{3}$$

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

d) $|3x+4| + 3 = 10$

$$\begin{array}{r} |3x+4| + 3 = 10 \\ \underline{-3} \quad \underline{-3} \end{array}$$
$$|3x+4| = 7$$

$$\begin{array}{r} 3x+4 = 7 \\ \underline{-4} \quad \underline{-4} \end{array}$$

$$\frac{3x}{3} = \frac{3}{3}$$

$$\boxed{x = 1}$$

$$\begin{array}{r} 3x+4 = -7 \\ \underline{-4} \quad \underline{-4} \end{array}$$

$$\frac{3x}{3} = \frac{-11}{3}$$

$$\boxed{x = \frac{-11}{3}}$$

5) a) Let $x = 1^{\text{st}}$ int
 $x+1 = 2^{\text{nd}}$ int
 $x+2 = 3^{\text{rd}}$ int

$x + x+1 + x+2 = 147$

$3x + 3 = 147$

$\underline{-3} \quad \underline{-3}$

$\frac{3x}{3} = \frac{144}{3}$

$x = 48$
 $x+1 = 49$
 $x+2 = 50$

b) $3x - 17 = 220$

$\underline{+17} \quad \underline{+17}$

$\frac{3x}{3} = \frac{237}{3}$

$x = 79$

c) $5x + 23 = 368$

$\underline{-23} \quad \underline{-23}$

$\frac{5x}{5} = \frac{345}{5}$

$x = 69$

6) a) $|2x+1| \leq 5$

$2x+1 \leq 5$

$\underline{-1} \quad \underline{-1}$

$\frac{2x}{2} \leq \frac{4}{2}$

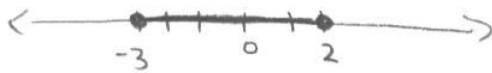
$x \leq 2$

$2x+1 \geq -5$

$\underline{-1} \quad \underline{-1}$

$\frac{2x}{2} \geq \frac{-6}{2}$

$x \geq -3$



$[-3, 2]$

b) $|x-7| > 3$

$\left(\frac{4}{1}\right) \frac{x-7}{4} > 3 \left(\frac{4}{1}\right) \quad \left(\frac{4}{1}\right) \frac{x-7}{4} < -3 \left(\frac{4}{1}\right)$

$x-7 > 12$

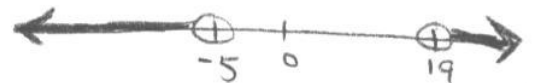
$\underline{+7} \quad \underline{+7}$

$x > 19$

$x-7 < -12$

$\underline{+7} \quad \underline{+7}$

$x < -5$



$(-\infty, -5) \cup (19, \infty)$

c) $|x+4| - 6 > 5$

$\underline{+6} \quad \underline{+6}$

$|x+4| > 11$

$x+4 > 11$

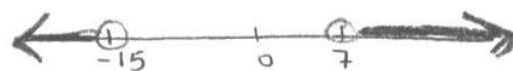
$\underline{-4} \quad \underline{-4}$

$x > 7$

$x+4 < -11$

$\underline{-4} \quad \underline{-4}$

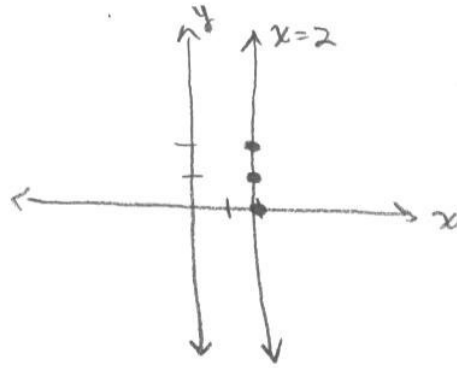
$x < -15$



$(-\infty, -15) \cup (7, \infty)$

⑦ a) $x=2$

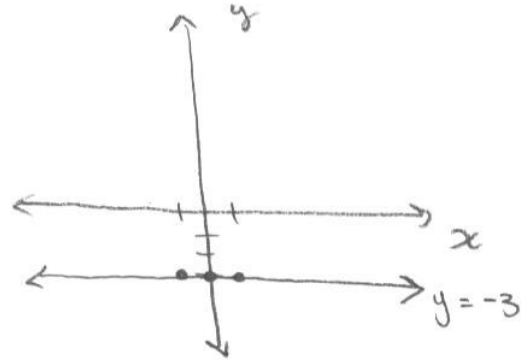
y	$x=2$	x
0	$x=2$	2
1	$x=2$	2
2	$x=2$	2



⑤

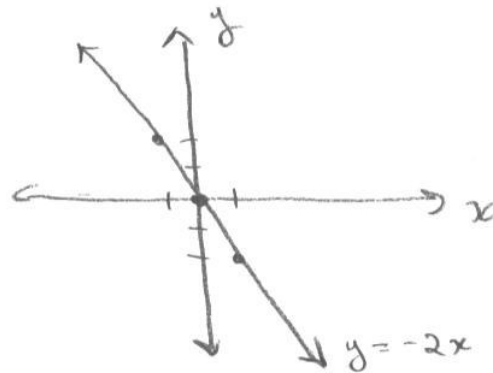
b) $y=-3$

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



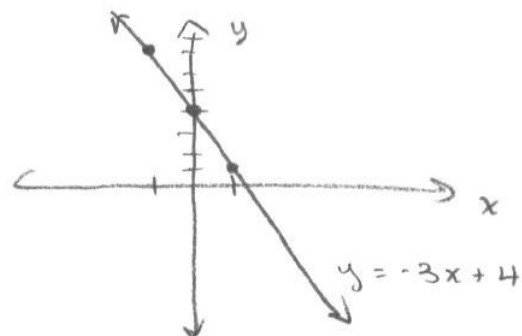
c) $y=-2x$

x	$y=-2x$	y
-1	$y=-2(-1)$	2
0	$y=-2(0)$	0
1	$y=-2(1)$	-2



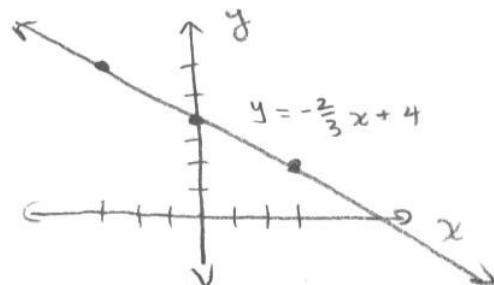
d) $y=-3x+4$

x	$y=-3x+4$	y
-1	$y=-3(-1)+4$	7
0	$y=-3(0)+4$	4
1	$y=-3(1)+4$	1



e) $y=-\frac{2}{3}x+4$

x	$y=-\frac{2}{3}x+4$	y
-3	$y=-\frac{2}{3}(-3)+4$	6
0	$y=-\frac{2}{3}(0)+4$	4
3	$y=-\frac{2}{3}(3)+4$	2



8) a) $(x_1, y_1) (x_2, y_2)$
 $(6, 5) (4, 2)$
 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 5}{4 - 6} = \frac{-3}{-2} = \frac{3}{2}$

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

$$y - 5 = \frac{3}{2}(x - 6)$$

$$y - 5 = \frac{3}{2}x - 9$$

$$y = \frac{3}{2}x - 4$$

b) $(x_1, y_1) (x_2, y_2)$
 $(2, 7) (-5, -7)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-7 - 7}{-5 - 2} = \frac{-14}{-7} = 2$$

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

$$y - 7 = 2(x - 2)$$

$$y - 7 = 2x - 4$$

$$y = 2x + 3$$

c) $(x_1, y_1) (x_2, y_2)$
 $(6, 2) (6, -5)$

$$m = \frac{-5 - 2}{6 - 6} = \frac{-7}{0} \text{ undefined vertical line}$$

$$\Rightarrow x = 6$$

d) $(x_1, y_1) (x_2, y_2)$
 $(3, 4) (2, 4)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 4}{2 - 3} = \frac{0}{-1} = 0$$

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

$$y - 4 = 0(x - 3)$$

$$y - 4 = 0$$

$$y = 4$$

9) a) $x - 2y = -6$

x-int: $y = 0$

$$x - 2(0) = -6$$

$$x = -6$$

$$(-6, 0)$$

y-int: $x = 0$

$$0 - 2y = -6$$

$$\frac{-2y}{-2} = \frac{-6}{-2}$$

$$y = 3$$

$$(0, 3)$$

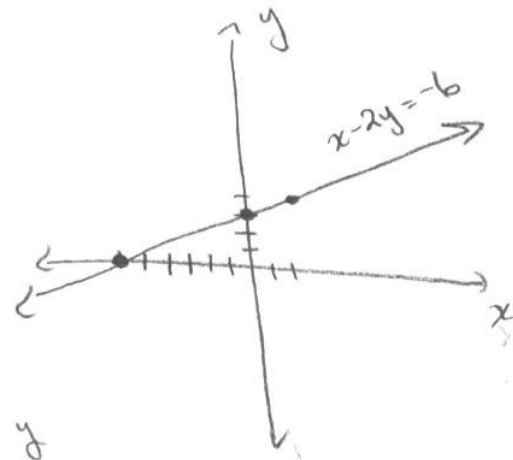
third point: pick

any x-value, say 2, solve for y

$$2 - 2y = -6$$

$$\frac{-2y}{-2} = \frac{-8}{-2}$$

$$y = 4 \Rightarrow (2, 4)$$



$$b) \quad 6x - 3y = -9$$

$$x\text{-int: } y=0$$

$$6x - 3(0) = -9$$

$$\frac{6x}{6} = \frac{-9}{6}$$

$$x = -\frac{9}{6} = -\frac{3}{2} = -1.5$$

$$(-1.5, 0)$$

or

$$\left(-\frac{3}{2}, 0\right)$$

$$y\text{-int: } x=0$$

$$6(0) - 3y = -9$$

$$\frac{-3y}{-3} = \frac{-9}{-3}$$

$$y = 3$$

$$(0, 3)$$

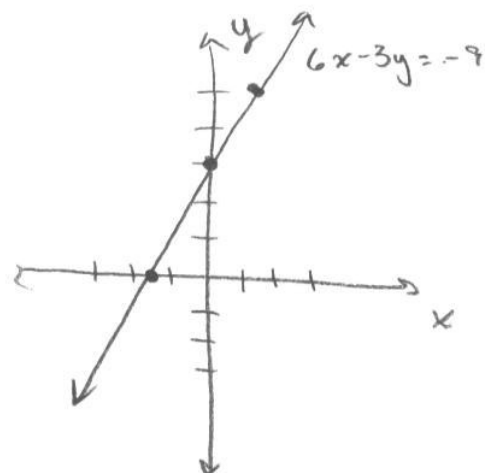
$$3^{\text{rd}} \text{ point: } x=1$$

$$6(1) - 3y = -9$$

$$\frac{6 - 3y}{-6} = \frac{-9}{-6}$$

$$\frac{-3y}{-3} = \frac{-15}{-3}$$

$$y = 5 \Rightarrow (1, 5)$$



$$c) \quad y = -2x + 6$$

$$x\text{-int: } y=0$$

$$0 = -2x + 6$$

$$\frac{-6}{-2} = \frac{-2x}{-2}$$

$$3 = x$$

$$(3, 0)$$

$$y\text{-int: } x=0$$

$$y = -2(0) + 6$$

$$y = 6$$

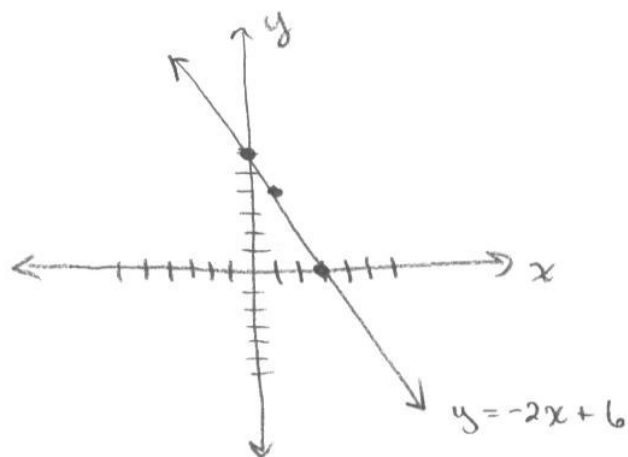
$$(0, 6)$$

$$3^{\text{rd}} \text{ point: } x=1$$

$$y = -2(1) + 6$$

$$y = -2 + 6 = 4$$

$$(1, 4)$$



$$10. a) \quad m = -3 \quad (0, 4)$$

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

$$y - 4 = -3(x - 0)$$

$$y - 4 = -3x$$

$$\frac{+4}{+4} \quad \frac{+4}{+4}$$

$$y = -3x + 4$$

$$b) \quad m = 2 \quad (-2, -4)$$

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

$$y - (-4) = 2(x - (-2))$$

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

$$y + 4 = 2x + 4$$

$$\frac{-4}{-4} \quad \frac{-4}{-4}$$

$$y = 2x$$

$$c) \quad m = \frac{3}{4} \quad (-3, 5)$$

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

$$y - 5 = \frac{3}{4}(x - (-3))$$

$$y - 5 = \frac{3}{4}(x + 3)$$

$$y - 5 = \frac{3}{4}x + \frac{9}{4}$$

$$\frac{+5}{+5} \quad \frac{+5}{+5}$$

$$y = \frac{3}{4}x + \frac{9}{4} + 5\left(\frac{4}{4}\right)$$

$$y = \frac{3}{4}x + \frac{29}{4}$$

⑪ a) $(4, -1)$ $(-2, 5)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-1)}{-2 - 4} = \frac{5 + 1}{-6} = \frac{6}{-6} = -1$$

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

$$y - (-1) = -1(x - 4)$$

$$y + 1 = -x + 4$$

$$\boxed{y = -x + 3}$$

b) $(2, -4)$ $m = -2$

since all lines have = slopes

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

$$y - (-4) = -2(x - 2)$$

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

$$\boxed{y = -2x}$$

c) $(-6, 1) \perp$ to $x + 3y = 9$

$$\frac{x + 3y = 9}{-x}$$

$$\frac{3y}{3} = \frac{9 - x}{3}$$

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

$$m = -\frac{1}{3} \text{ of } x + 3y = 9$$

$$\text{So line } \perp \text{ to it } \Rightarrow m = \frac{3}{1}$$

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

$$y - 1 = 3(x - (-6))$$

$$y - 1 = 3(x + 6)$$

$$y - 1 = 3x + 18$$

$$\frac{+1}{+1}$$

$$\boxed{y = 3x + 19}$$

⑫ a) $2x + 5y \leq 10$

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

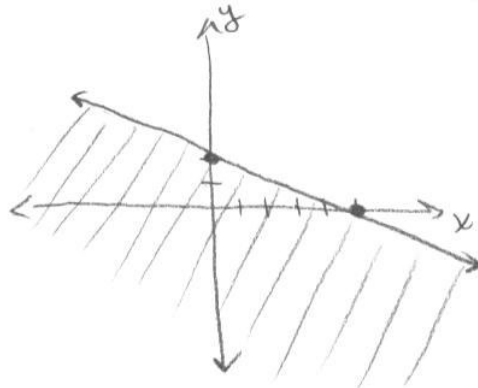
$$\frac{5y}{5} \leq \frac{10 - 2x}{5}$$

$$y \leq \frac{10}{5} - \frac{2}{5}x$$

$$y \leq 2 - \frac{2}{5}x$$

$$m = -\frac{2}{5}$$

$$b = 2$$



test point:
 $(0, 0)$

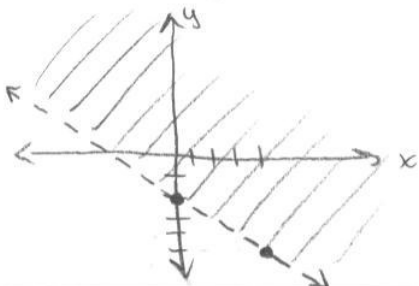
$$0 \leq 2 - \frac{2}{5}(0)$$

$$0 \leq 2$$

yes,
shade

b) $y > -\frac{3}{4}x - 2$

$$m = -\frac{3}{4} \quad b = -2$$



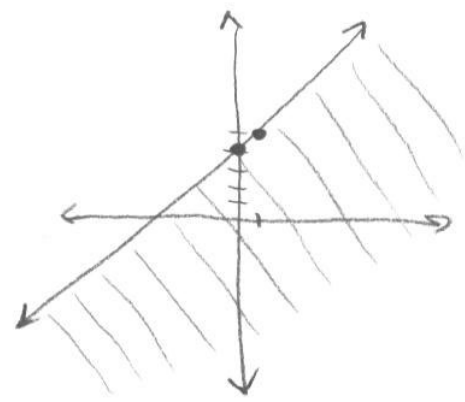
test point
 $(0, 0)$

$$0 > -\frac{3}{4}(0) - 2$$

$$0 > -2$$

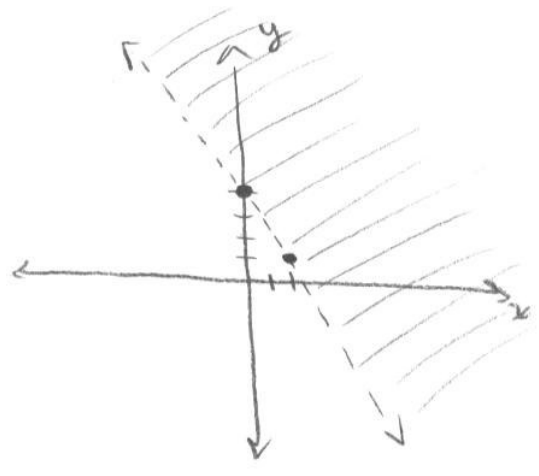
yes,
shade

$$\begin{aligned}
 c) \quad x - y &\geq -4 \\
 \quad \quad +y \quad +y \\
 x &\geq -4 + y \\
 +4 \quad \quad +4 \\
 x + 4 &\geq y \\
 m = 1 \quad b = 4
 \end{aligned}$$



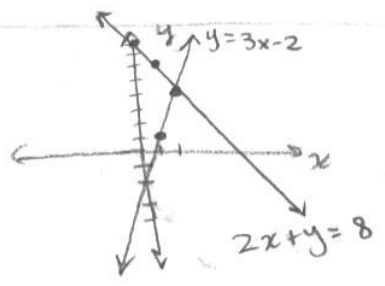
test point
 $(0, 0)$
 $0 - 0 \geq -4$
 $0 \geq -4$
 Yes, shade ☺

$$\begin{aligned}
 d) \quad -3x - 2y &< -8 \\
 \quad \quad +2y \quad +2y \\
 -3x &< -8 + 2y \\
 +8 \quad \quad +8 \\
 8 - 3x &< 2y \\
 \frac{8 - 3x}{2} &< \frac{2y}{2} \\
 \frac{8}{2} - \frac{3}{2}x &< y \\
 4 - \frac{3}{2}x &< y \\
 m = -\frac{3}{2} \quad b = 4
 \end{aligned}$$



test point:
 $(0, 0)$
 $-3(0) - 2(0) < -8$
 $0 < -8$
 No, don't shade $(0, 0)$

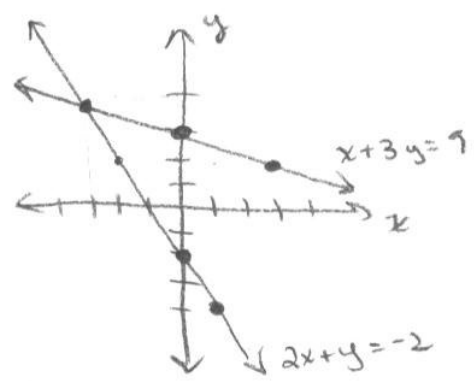
$$\begin{aligned}
 \textcircled{13} \quad a) \quad &\begin{cases} y = 3x - 2 & m = 3 \\ & b = -2 \\ 2x + y = 8 \end{cases} \\
 &\begin{aligned} &\underline{-2x} \quad \underline{-2x} \\ y &= 8 - 2x & m = -2 \\ & & b = 8 \end{aligned}
 \end{aligned}$$



Intersection:
 $(2, 4)$
 $x = 2 \quad y = 4$

$$\begin{aligned}
 b) \quad x + 3y &= 9 \\
 \underline{-x} \quad \quad \underline{-x} \\
 3y &= 9 - x \\
 \frac{3y}{3} &= \frac{9 - x}{3} \\
 y &= 3 - \frac{1}{3}x \\
 m &= -\frac{1}{3} \\
 b &= 3
 \end{aligned}$$

$$\begin{aligned}
 2x + y &= -2 \\
 \underline{-2x} \quad \underline{-2x} \\
 y &= -2 - 2x \\
 m &= -2 \\
 b &= -2
 \end{aligned}$$

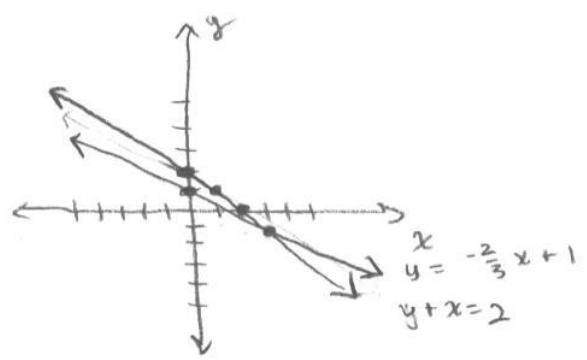


Intersection:
 $(-3, 4)$
 $x = -3 \quad y = 4$

c) $y = -\frac{2}{3}x + 1$ $m = -\frac{2}{3}$
 $b = 1$

$x + y = 2$
 $\underline{-x} \quad \underline{-x} \quad m = -1$
 $y = 2 - x \quad b = 2$

intersection: $(3, -1)$ $x = 3$
 $y = -1$



14 a) $x = 3y - 7$ }
 $4x + 3y = 2$ }

$4(3y - 7) + 3y = 2$
 $12y - 28 + 3y = 2$

$15y - 28 = 2$
 $\quad \underline{+28} \quad \underline{+28}$

$\frac{15y}{15} = \frac{30}{15}$

$y = 2$

$x = 3(2) - 7 = 6 - 7 = -1$

$\Rightarrow (-1, 2)$

b) $y = -3x - 7$ }
 $-4x - 2y = 12$ }

$-4x - 2(-3x - 7) = 12$
 $-4x + 6x + 14 = 12$

$2x + 14 = 12$
 $\quad \underline{-14} \quad \underline{-14}$

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

$x = -1$

$y = -3(-1) - 7 = 3 - 7 = -4$

$(-1, -4)$

$$\textcircled{15} \text{ a) } \begin{cases} -3(2x + y = 5) \\ x + 3y = -10 \end{cases}$$

⇓

$$\begin{array}{r} -6x - 3y = -15 \\ + \quad x + 3y = -10 \\ \hline \end{array}$$

$$\begin{array}{r} -5x = -25 \\ \underline{-5} \quad \underline{-5} \end{array}$$

$$x = 5$$

$$x + 3y = -10$$

$$\begin{array}{r} 5 + 3y = -10 \\ \underline{-5} \quad \underline{-5} \end{array}$$

$$\frac{3y}{3} = \frac{-15}{3}$$

$$y = -5$$

So $\boxed{x = 5, y = -5}$

check:

$$\begin{array}{l} 2x + y = 5 \\ 2(5) - 5 = 5 \\ 10 - 5 = 5 \\ 5 = 5 \checkmark \end{array}$$

17

$$\text{b) } \begin{cases} 6x - y = -14 \\ -2(3x + 3y = 0) \end{cases}$$

⇓

$$\begin{array}{r} 6x - y = -14 \\ + \quad -6x - 6y = 0 \\ \hline \end{array}$$

$$\begin{array}{r} -7y = -14 \\ \underline{-7} \quad \underline{-7} \end{array}$$

$$y = 2$$

$$6x - y = -14$$

$$\begin{array}{r} 6x - 2 = -14 \\ \underline{+2} \quad \underline{+2} \end{array}$$

$$\frac{6x}{6} = \frac{-12}{6}$$

$$x = -2$$

S. $\boxed{x = -2, y = 2}$

check:

$$\begin{array}{l} 3x + 3y = 0 \\ 3(-2) + 3(2) = 0 \\ -6 + 6 = 0 \\ 0 = 0 \checkmark \end{array}$$