4.2 Forms for Linear Equations

1)

a) It is best to use slope-intercept form when you know the slope of a line and its *y*-intercept.

b) It is best to use point-slope form whenever you know the slope of the line and a point that lies on that line. If given two points, find the slope and then use point-slope form.

c) It is usually not convenient to write linear equations in standard form. It should only be written this way if a particular problem yields an equation written this way (see Example 16).

3)

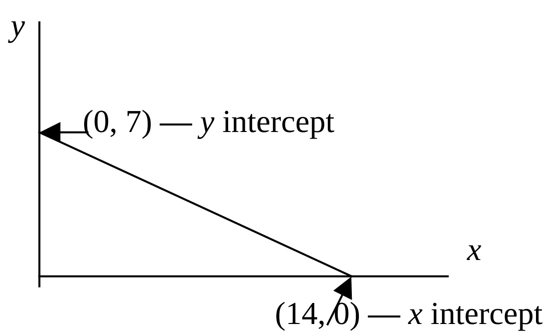
a) Equation is in slope-intercept form: $y = mx + b$.
By inspection, m = 0.36; *y*-intercept = (0, 0.1)

b) Equation is in slope-intercept form: $y - y_1 = m(x - x_1)$.
$y - \frac{1}{3} = 2(x - \frac{5}{2})$ èBy inspection, m = 2
$y - \frac{1}{3} = 2x - \frac{10}{2}$
$y - \frac{1}{3} = 2x - 5$
$y = 2x - \frac{15}{3} + \frac{1}{3}$
$y = 2x - \frac{14}{3}$
Now by inspection, *y*-intercept $= (0, \frac{14}{3})$

c) Use algebra to write the equation in slope-intercept form:
$x + 4y = 7$
$4y = -x + 7$
$y = \frac{-x+7}{4} = -\frac{1}{4}x + \frac{7}{4}$
Now by inspection, $m = -\frac{1}{4}$, *y*-intercept = (0, $\frac{7}{4}$)

5)

a)



b) $m = \frac{}{14-0} = \frac{}{14} = -\frac{}{2}$

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

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

9) $y - 7 = (-\frac{1}{3})(x - 2)$ çWe are given a point and a slope (use point slope form)!

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

$y = -\frac{1}{3}x + \frac{2}{3} + \frac{21}{3}$

$y = -\frac{1}{3}x + \frac{23}{3}$ çSlope-Intercept Form

11)

a) y = 3500 ft

b) y will decrease by 22 feet.

c) From parts (a) and (b), our initial value is 3500 and the rate of change (slope) is $^{-}22$. Therefore $y = 3500 - 22x$.

13)

a)

Hour of Day	**Elapsed hrs since 2 pm**	**Temperature (°F)**
2:00 PM	0	87
3:00 PM	1	85.5
4:00 PM	2	84
5:00 PM	3	82.5
6:00 PM	4	81
7:00 PM	5	79.5
8:00 PM	6	78
9:00 PM	7	76.5
10:00 PM	8	75
11:00 PM	9	73.5
12:00 AM	10	72
1:00 AM	11	70.5
2:00 AM	12	69
3:00 AM	13	67.5
4:00 AM	14	66

b)

Given our data we can write an equation in point-slope form:

$F - 81 = (-1.5)(t - 4)$

$F - 81 = (-1.5)t + 6$

$F = {}^{-}1.5t + 87$ for $0 \le t \le 14$

c) For "friendly" windows see Figure 4 in Section 2.4. Here is one:

Xmin = 0 Xmax = 18.8 Xscl = 2

Ymin = 66 Ymax = 87 Yscl = 2

High temperature occurs at 2 PM (t = 0).

High temperature = 87°F

Low temperature occurs at 4 AM (t = 14).

Low temperature = 66°F

d) Use the equation $F = -1.5t + 87$ to find the exact *x* and *y*-intercepts.
High temperature occurs at 2 PM ($t = 0$).
High temperature = 87°F

Low temperature occurs at 4 AM ($t = 14$).
Low temperature = $^-1.5(14) + 87 = {}^-21 + 87 = 66$°F

15) Since Paul can complete one job in 3 hrs, he can complete $\frac{1}{3}$ of a job in one hr. Likewise, Joan can complete $\frac{1}{2}$ of a job in one hour. Thus Paul's work rate = $\frac{1}{3}\frac{\text{job}}{\text{hr}}$ and Joan's work rate is $\frac{1}{2}\frac{\text{job}}{\text{hr}}$. If *x* is the number of hours Paul works and *y* is the number of hours Joan works, then Paul will complete $\frac{1}{3}x$ jobs and Joan will complete $\frac{1}{2}y$ jobs. Since they both must work to complete 6 jobs, we have $\frac{1}{3}x + \frac{1}{2}y = 6$.

a) $\frac{1}{3}x + \frac{1}{2}y = 6$

$\frac{1}{2}y = -\frac{1}{3}x + 6$

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

Graph $Y_1 = (^-2/3)X + 12$
Here is a "friendly window" that shows our intercepts when tracing:
Xmin = 0 Xmax = 18.8 Xscl = 2
Ymin = 0 Ymax = 12.4 Yscl = 2

b) The *x*-intercept (18, 0) tells us that it will take Paul 18 hrs to complete 6 jobs all by himself (since *y* = 0 means Joan is working zero hours). Similarly, the *y*-intercept (0, 12) indicates that it will take Joan 12 hrs to complete 6 jobs working alone.

c) For every increase of 3 hours for Paul, Joan's hours decrease by 2 OR for every decrease of 3 hours for Paul, Joan's hours increase by 2.

Skill and Review

17) $^-24 - {}^-8 - 6 + 22 = {}^-24 + 8 - 6 + 22 = ({}^-24 + {}^-6) + (8 + 22) = {}^-30 + 30 = 0$

19) $\frac{4^2 - 2^4}{3^{-1}}$

$= \frac{16 - 16}{3^{-1}}$

$= \frac{0}{3^{-1}}$

$= 0$

Check on Calculator: $\dfrac{(4\wedge 2-2\wedge 4)}{(3\wedge(-1))}=0$

