

1. (10pts) Find the equation of the line (in form  $y = mx + b$ ) that passes through point  $(-2, 2)$  and is perpendicular to the line  $2x - 3y = 15$ . Draw both lines.

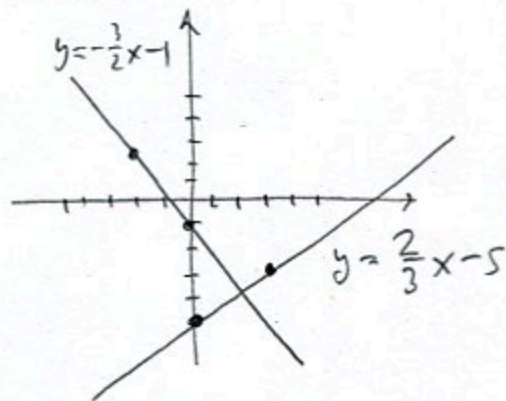
$$2x - 3y = 15 \quad y - 2 = -\frac{3}{2}(x - (-2))$$

$$-3y = -2x + 15 \quad | \div -3 \quad y - 2 = -\frac{3}{2}x - 3$$

$$y = \frac{2}{3}x - 5 \quad \boxed{y = -\frac{3}{2}x - 1}$$

slope =  $\frac{2}{3}$ , so slope of  
perp. line is  $-\frac{3}{2}$

Equation of  
perp. line,



2. (6pts) Find the linear function  $f$  given that  $f(1) = 4$  and  $f(-2) = -5$ .

Need line through points  
 $(1, 4)$  and  $(-2, -5)$ ,

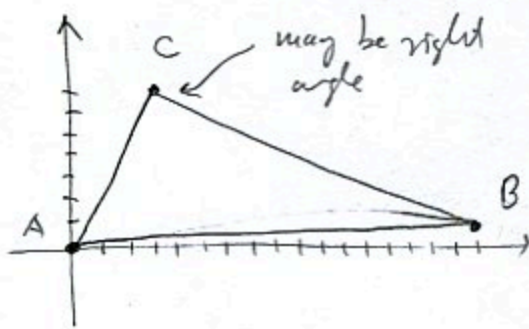
$$m = \frac{-5 - 4}{-2 - 1} = \frac{-9}{-3} = 3$$

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

$$y = 3x - 3 + 4$$

$$y = 3x + 1$$

3. (8pts) Draw the triangle with vertices  $A = (0, 0)$ ,  $B = (17, 1)$  and  $C = (3, 7)$ . Use slopes to determine if the triangle is a right triangle.



$$\text{slope of line AC} = \frac{7-0}{3-0} = \frac{7}{3}$$

$$\text{slope of line BC} = \frac{7-1}{3-17} = \frac{6}{-14} = -\frac{3}{7}$$

Since slopes are opposite reciprocals,  
lines AC and BC are perpendicular.

4. (4pts) The number of traffic fatalities in the US has been declining in recent years. In 2004, 42,836 people died in traffic accidents, while in 2012, 33,782 did. What is the average rate of change in the number of traffic fatalities from 2004 to 2012? What are the units for the average rate?

$$\text{avg. rate of change} = \frac{33,782 - 42,836}{2012 - 2004} = \frac{-9054}{8} = -1131.75 \text{ traffic fatalities/year}$$

5. (12pts) Manuela used the same cab company twice recently. On one occasion, she traveled 4 miles and paid \$11.71. On another occasion, she traveled 11 miles and paid \$28.44.

a) Assuming that the cost of a cab ride with this company  $C(x)$  is a linear function of miles traveled  $x$ , write a formula for  $C(x)$ .

b) How much would Manuela pay if she rode 0 miles? What is the meaning of this number?

c) What is the meaning of the slope in this example?

a) Need equation of line  
through  $(4, 11.71)$  and  $(11, 28.44)$

$$m = \frac{28.44 - 11.71}{11 - 4} = \frac{16.73}{7} = 2.39$$

$$y - 11.71 = 2.39(x - 4)$$

$$y - 11.71 = 2.39x - 9.56$$

$$y = 2.39x + 2.15$$

b)  $C(0) = 2.15$   
initial cost to take cab.

c) slope = 2.39 represents  
cost-per-mile-traveled

6. (20pts) A convenience store manager is trying to establish the relationship between the daily high temperature and the number of bottles of beverages sold on the day. The table shows the data:  $T$  is the temperature in  $^{\circ}\text{F}$ , and  $S$  is the number of bottles sold. Solve the problems below with accuracy 6 decimal points.

a) Draw the scatterplot of the data. Does the relationship look linear?

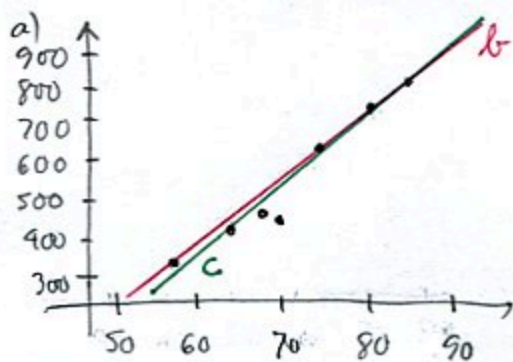
b) Use two points in the scatterplot to get an equation of a line that models the relationship between  $T$  and  $S$ . Draw the line on the graph.

c) Use your calculator to find the "line of best fit" for the data. Draw the line on the graph.

d) Find the coefficient of correlation  $r$ . How strong is the linear relationship between  $T$  and  $S$ ?

e) What amount of sales does the manager expect if the temperature is  $92^{\circ}$ ?

$T$	$S$
58	335
64	410
68	460
70	450
75	610
80	735
84	780



Yes, looks linear

b) Choose  $(58, 335)$  and  $(84, 780)$

$$m = \frac{780 - 335}{84 - 58} = \frac{445}{26} = 17.115384$$

$$y - 335 = \frac{445}{26}(x - 58)$$

$$y = 17.115384x - 657.692308$$

c) Calculator gives

$$y = 18.36132x - 768.899826$$

d)  $r = 0.977921$ , close to 1, so  
linear relationship is strong

$$e) 18.36132 \cdot 92 - 768.899826 \\ = 920.34 \text{ bottles}$$