Section 4.2 Linear Functions

Problem 1.

(a) A $(0, f(0))$; B $(b, f(b))$; C $(c, f(c))$; D $(d, f(d))$; E $(e, f(e))$

(b) 0

(c) $y = f(b)$ (or $y = f(d)$)

(d) $f(b)$

(e) $d - b$

(f) $\frac{f(c)-f(0)}{c}$

(g) $y = \left(\frac{f(c)-f(0)}{c}\right) x + f(0)$

(h) $x = d$

(i) Undefined, as the line $\mathcal{L}_3$ is vertical.

Problem 2.

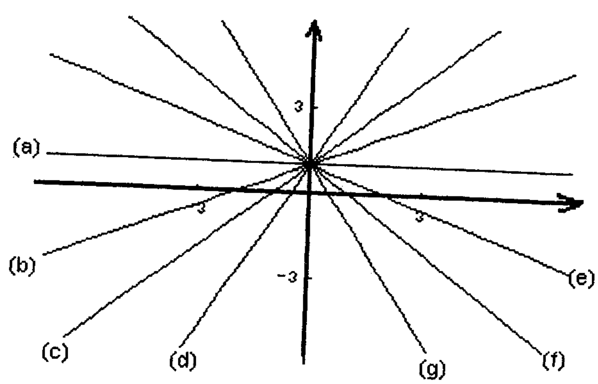
(a) $\frac{2}{5}$

(b) 3

(c) No slope. Vertical line $x = \sqrt{2}$

(d) 0 (Horizontal line)

Problem 3.



Section 4.3 Modeling and Interpreting the Slope

Problem 1.

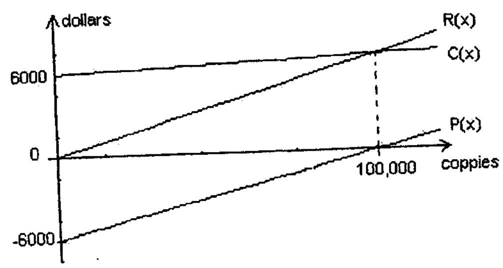
(a) $R(x) = 0.07x$

(b) $C(x) = 6000 + 0.01x$

(c) $P(x) = R(x) - C(x) = 0.06x - 6000$

(d) $P(x) = 0.06x - 6000 = 0 \Rightarrow x = 100,000$ copies must be made to break even.

(e)

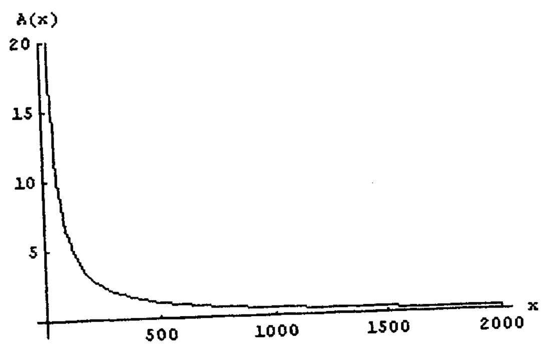


(f) $A(x) = \frac{C(x)}{x} = \frac{6000}{x} + 0.01$

(g)

x	0	1	10	100	1000	10000
$A(x)$	*undefined*	6000.01	600.01	60.01	6.01	0.61

(h)



Problem 4.

(a) First, we find the slope m of the line, $m = \frac{550-700}{600} = -\frac{150}{600} = -\frac{1}{4}$. The equation of the line becomes $p - 700 = -\frac{1}{4}(q - 2400)$ or $p = -\frac{1}{4}q + 1300$

(b) With increase in demand the price per item increases

Problem 5.

(a) We want to find the formula for the linear function $F(C)$, where C is degrees Celsius and F is the corresponding degrees Fahrenheit. We have two points on the graph of F: $(0, 32)$ and $(100, 212)$. Now the slope of $F(C)$ is $m = \frac{212-32}{100} = \frac{9}{5}$, using the point-slope form of a line, we have $F - 32 = \frac{9}{5}(C - 0)$. Therefore, $F(C) = \frac{9}{5}C + 32$

(b) $F(C) = \frac{9}{5}C + 32 \Rightarrow F - 32 = \frac{9}{5}C \Rightarrow C(F) = \frac{5}{9}(F - 32) = \frac{5}{9}F - \frac{160}{9}$.

(c) Since 1 degree Kelvin = 1 degree Celsius, the slope of the linear function $K(C)$, where C is degrees Celsius and K is degrees Kelvin, is 1. As $(0, 273.15)$ is on graph of $K(C)$, we have $K(C) = c + 273.15$

(d) $K(C(F)) = C(F) + 273.15 = \frac{5}{9}F - \frac{160}{9} + 273.15 = \frac{5}{9}F + \frac{45,967}{180}$.

4.4

Problem 3.

(a) Equation of the supply curve:
the slope m is given by $m = \frac{12}{9} = \frac{4}{3}$. Equation of the line is $y = \frac{4}{3}(x-9)$ or $y = \frac{4}{3}x - 12$
Equation of the demand curve:
The slope m is given by $m = \frac{0-16}{12} = -\frac{4}{3}$

(b) 6.75
Equation for the line becomes: $y = -\frac{4}{3}(x-12)$ or $y = -\frac{4}{3}x + 16$.

Problem 4.

$$C(t) = \begin{cases} 250 & ,0 < t \le 2 \\ 250 + 100(t-2) & ,t > 2 \end{cases}.$$

Problem 10.

Let $M(t)$ be the total daily mileage after t hours. The two points $(0,3)$ and $\left(\frac{1}{3}, \frac{13}{3}\right)$ are the graph of $M(t)$. As $M(t)$ is linear, we calculate its slope to be $m = \frac{\frac{13}{3}-3}{\frac{1}{3}-0} = 4$ and use the slope-intercept form to obtain the equation $M(t) = 3 + 4t$. They stop when $M(t) = 13$, which occurs at $t = 2.5$ hours. The domain of $M(t)$ is $[0, 2.5]$.