
Assignment #1.2a Solutions

8. The vertex of the parabola on the left is $(3, 0)$, so an equation is $y = a(x - 3)^2 + 0$. Since the point $(4, 2)$ is on the parabola, we'll substitute 4 for x and 2 for y to find a . $2 = a(4 - 3)^2 \Rightarrow a = 2$, so an equation is $f(x) = 2(x - 3)^2$.

The y -intercept of the parabola on the right is $(0, 1)$, so an equation is $y = ax^2 + bx + 1$. Since the points $(-2, 2)$ and $(1, -2.5)$ are on the parabola, we'll substitute -2 for x and 2 for y as well as 1 for x and -2.5 for y to obtain two equations with the unknowns a and b .

$$(-2, 2): \quad 2 = 4a - 2b + 1 \Rightarrow 4a - 2b = 1 \quad (1)$$

$$(1, -2.5): \quad -2.5 = a + b + 1 \Rightarrow a + b = -3.5 \quad (2)$$

$2 \cdot (2) + (1)$ gives us $6a = -6 \Rightarrow a = -1$. From (2), $-1 + b = -3.5 \Rightarrow b = -2.5$, so an equation is $g(x) = -x^2 - 2.5x + 1$.

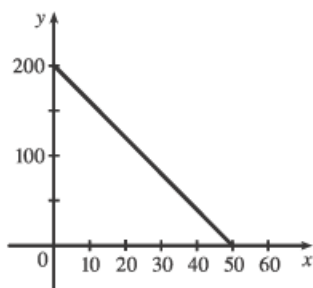
10. (a) For $T = 0.02t + 8.50$, the slope is 0.02, which means that the average surface temperature of the world is increasing at a rate of 0.02°C per year. The T -intercept is 8.50, which represents the average surface temperature in $^\circ\text{C}$ in the year 1900.

$$(b) t = 2100 - 1900 = 200 \Rightarrow T = 0.02(200) + 8.50 = 12.50^\circ\text{C}$$

11. (a) $D = 200$, so $c = 0.0417D(\alpha + 1) = 0.0417(200)(\alpha + 1) = 8.34\alpha + 8.34$. The slope is 8.34, which represents the change in mg of the dosage for a child for each change of 1 year in age.

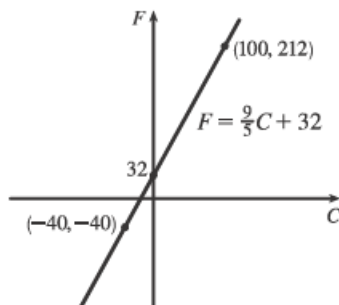
(b) For a newborn, $\alpha = 0$, so $c = 8.34$ mg.

12. (a)



(b) The slope of -4 means that for each increase of 1 dollar for a rental space, the number of spaces rented *decreases* by 4. The y -intercept of 200 is the number of spaces that would be occupied if there were no charge for each space. The x -intercept of 50 is the smallest rental fee that results in no spaces rented.

13. (a)



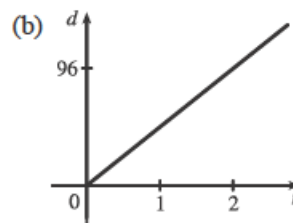
(b) The slope of $\frac{9}{5}$ means that F increases $\frac{9}{5}$ degrees for each increase of 1°C . (Equivalently, F increases by 9 when C increases by 5 and F decreases by 9 when C decreases by 5.) The F -intercept of 32 is the Fahrenheit temperature corresponding to a Celsius temperature of 0.

Assignment #1.2a Solutions

14. (a) Let d = distance traveled (in miles) and t = time elapsed (in hours). At

$t = 0$, $d = 0$ and at $t = 50$ minutes $= 50 \cdot \frac{1}{60} = \frac{5}{6}$ h, $d = 40$. Thus we

have two points: $(0, 0)$ and $(\frac{5}{6}, 40)$, so $m = \frac{40 - 0}{\frac{5}{6} - 0} = 48$ and so $d = 48t$.



- (c) The slope is 48 and represents the car's speed in mi/h.

15. (a) Using N in place of x and T in place of y , we find the slope to be $\frac{T_2 - T_1}{N_2 - N_1} = \frac{80 - 70}{173 - 113} = \frac{10}{60} = \frac{1}{6}$. So a linear

equation is $T - 80 = \frac{1}{6}(N - 173) \Leftrightarrow T - 80 = \frac{1}{6}N - \frac{173}{6} \Leftrightarrow T = \frac{1}{6}N + \frac{307}{6}$ [$\frac{307}{6} = 51.1\bar{6}$].

- (b) The slope of $\frac{1}{6}$ means that the temperature in Fahrenheit degrees increases one-sixth as rapidly as the number of cricket chirps per minute. Said differently, each increase of 6 cricket chirps per minute corresponds to an increase of 1°F .

- (c) When $N = 150$, the temperature is given approximately by $T = \frac{1}{6}(150) + \frac{307}{6} = 76.1\bar{6}^\circ\text{F} \approx 76^\circ\text{F}$.

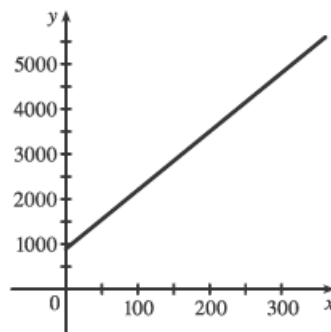
16. (a) Let x denote the number of chairs produced in one day and y the associated cost. Using the points $(100, 2200)$ and $(300, 4800)$, we get the slope

$\frac{4800 - 2200}{300 - 100} = \frac{2600}{200} = 13$. So $y - 2200 = 13(x - 100) \Leftrightarrow$

$$y = 13x + 900.$$

- (b) The slope of the line in part (a) is 13 and it represents the cost (in dollars) of producing each additional chair.

- (c) The y -intercept is 900 and it represents the fixed daily costs of operating the factory.



17. (a) We are given $\frac{\text{change in pressure}}{10 \text{ feet change in depth}} = \frac{4.34}{10} = 0.434$. Using P for pressure and d for depth with the point

$(d, P) = (0, 15)$, we have the slope-intercept form of the line, $P = 0.434d + 15$.

- (b) When $P = 100$, then $100 = 0.434d + 15 \Leftrightarrow 0.434d = 85 \Leftrightarrow d = \frac{85}{0.434} \approx 195.85$ feet. Thus, the pressure is 100 lb/in² at a depth of approximately 196 feet.

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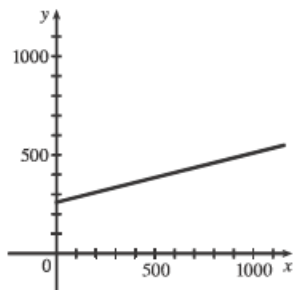
18. (a) Using d in place of x and C in place of y , we find the slope to be $\frac{C_2 - C_1}{d_2 - d_1} = \frac{460 - 380}{800 - 480} = \frac{80}{320} = \frac{1}{4}$.

So a linear equation is $C - 460 = \frac{1}{4}(d - 800) \Leftrightarrow C - 460 = \frac{1}{4}d - 200 \Leftrightarrow C = \frac{1}{4}d + 260$.

(b) Letting $d = 1500$ we get $C = \frac{1}{4}(1500) + 260 = 635$.

The cost of driving 1500 miles is \$635.

(c)



The slope of the line represents the cost per mile, \$0.25.

(d) The y -intercept represents the fixed cost, \$260.

(e) A linear function gives a suitable model in this situation because you have fixed monthly costs such as insurance and car payments, as well as costs that increase as you drive, such as gasoline, oil, and tires, and the cost of these for each additional mile driven is a constant.