

In Problems 1-6, write the equations in the form  $y = mx + b$ , then  $m$  is the slope and  $b$  is the  $y$ -intercept.

3. From  $x - y = 2$ , we have  $y = x - 2$ , so  $m = 1$  and  $b = -2$

5. From  $-5y + 2x = 9$ , we have  $5y = 2x - 9$  or  $y = \frac{2}{5}x - \frac{9}{5}$ , so  $m = \frac{2}{5}$  and  $b = -\frac{9}{5}$ .

8. The point slope form gives  $y - (-3) = -\frac{1}{3}(x - 2)$ . It follows that  $y = -\frac{1}{3}x + \frac{2}{3} - 3$ , so the equation of the line is  $y = -\frac{1}{3}x - \frac{7}{3}$ .

9. Since the slope is 0,  $y$  is always the same, so  $y = 4$ .

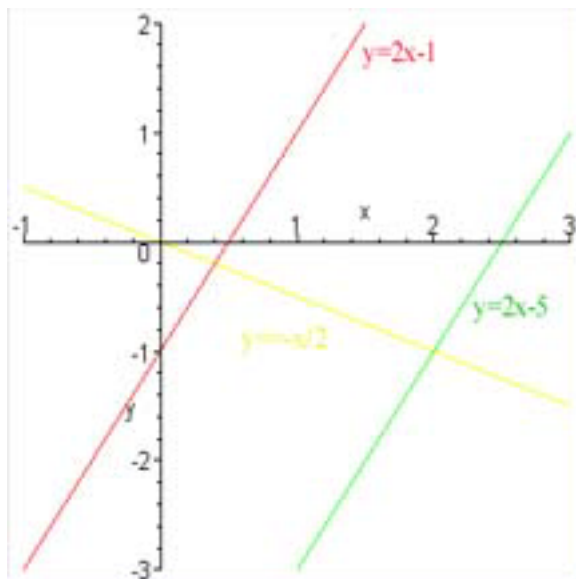
11. The slope is given by  $m = \frac{-3-3}{5-(-1)} = -1$ . From one point on the line,  $-3 = -1(5) + b$ , so  $b = 2$ . Thus,  $y = -x + 2$ .

13. Parallel lines have the same slope, so  $m = -2$ . The point slope form gives  $y - 5 = -2(x - \frac{1}{2})$ . It follows that  $y = -2x + 1 + 5$ , so the equation of the line is  $y = -2x + 6$ .

15. The slope of the given line and the parallel line is  $m = -\frac{5}{2}$ . Since the point on the line is  $(0, 17)$ , the  $y$ -intercept is 17, so the equation of the line is  $y = -\frac{5}{2}x + 17$ .

17. The slope of the given line is  $m_1 = \frac{4}{3}$ , the perpendicular line has the slope  $m_2 = -\frac{3}{4}$ . Note that  $m_1 m_2 = -1$ . From the point slope form of a line, it follows that  $y - 2 = -\frac{3}{4}(x - 3)$ . Thus,  $y = -\frac{3}{4}x + \frac{17}{4}$ .

19. The slope of the given line is 2. From the point slope form, it follows that  $y + 1 = 2(x - 2)$ , so the parallel line is  $y = 2x - 5$ . The perpendicular line passes through the origin, so  $b = 0$  and  $m = -\frac{1}{2}$ . It follows that the perpendicular line satisfies  $y = -\frac{x}{2}$ . The graph of the 3 lines is below.



21. Line goes through the origin, so  $b = 0$ . The slope is  $-2$ , so  $y = -2x$ .

23. There are  $10^5 \text{ cm} = 1 \text{ km}$ . Since the radius of the moon is  $R = 1.7 \times 10^3 \text{ km} = 1.7 \times 10^8 \text{ cm}$ , the volume of the moon is  $V = \frac{4}{3}\pi(1.7 \times 10^8)^3 \simeq 2.058 \times 10^{25} \text{ cm}^3$ . The density of the moon equals  $3.4 \text{ gm/cm}^3 = 3.4 \times 10^{-3} \text{ kg/cm}^3$ , so the mass of the moon is  $3.4 \times 2.058 \times 10^{22} = 6.997 \times 10^{22} \text{ kg}$ .

24. From the lecture notes,  $c = \frac{5}{9}(f - 32)$ , so  $\frac{9}{5}c = f - 32$ . Hence,  $f = \frac{9}{5}c + 32$ .

26. The folk formula is  $T = (N/4) + 40$ , so  $N = 4(T - 40)$ . Hence,  $N = 4T - 160$ , where  $N$  is the number of chirps per minute.

29. Average height of a 6-year old could be expected to be halfway between the heights of the 5 and 7 year olds, so the average 6-year old should be  $\frac{108+121}{2} = 114.5 \text{ cm}$ . The growth is 13 cm in 2 years, so the average growth rate is 6.5cm/yr.

31. From the model, we found the growth rate to be 6.46 cm/year, which is the slope of the line. Thus, a ten-year old child will on average be 6.46 cm taller than she was at nine, so an estimate of her height is  $h = 135 + 6.46 \simeq 141.5 \text{ cm}$ . A similar calculation gives the girl at age 15 as having approximately a height of  $h = 160 + 2(6.46) = 172.9 \text{ cm}$ . The first estimate is better, since it falls within the data points used to make the line fit, an interpolation, whereas the height at age 15 is an extrapolation.

33. a. Since the absorbance,  $A$ , and nickel concentration,  $N$ , satisfies the equation,  $A = kN + b$ , the slope,  $k$  is given by  $k = \frac{0.44-0.26}{0.04-0.02} = 9$ . From one of the points,  $(N, A) = (0.04, 0.44)$  it follows that  $0.44 = 9(0.04) + b$ , so  $b = 0.08$

b. The absorbance is  $A = 9(0.035) + 0.08 = 0.395$ .

c. The concentration of nickel satisfies  $0.31 = 9N + 0.08$ , so  $N = \frac{0.31-0.08}{9} = 0.026 \text{ mg/ml}$

35. a. Let  $y$  be the date and  $C$  be the concentration of  $\text{CO}_2$ , then the linear model has the form,  $C = ky + b$ . The slope satisfies  $k = \frac{338.5-325.3}{1980-1970} = 1.32$ . We find  $b$  by solving  $325.3 = 1.32(1970) + b$ , so  $b = -2275.1$ . Thus, the equation is given by  $C = 1.32y - 2275.1 \text{ ppm}$ .

b. This equation is used to estimate the level of  $\text{CO}_2$  in 2000 and 1950. In 2000,  $C = 1.32(2000) - 2275.1 = 364.9 \text{ ppm}$ . In 1950,  $C = 1.32(1950) - 2275.1 = 298.9 \text{ ppm}$ . The model gives a negative value for  $C$  in 1620, so this does not make sense. The linear model is only valid over a limited range of time.