In Problems 1-3, write the equations in the form $y = mx + b$, then m is the slope and b is the y-intercept.

1. From $y = \frac{2x-1}{5}$, we have $y = \frac{2}{5}x - \frac{1}{5}$, so $m = \frac{2}{5}$ and $b = -\frac{1}{5}$

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

3. From $y = \frac{3}{5}$, we have $y = 0 \cdot x + \frac{3}{5}$, so $m = 0$ and $b = \frac{3}{5}$.

4. The point slope form gives $y - 0 = \frac{1}{2}(x - 0)$. It follows that $y = \frac{1}{2}x$.

5. 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 $y = -\frac{1}{3}x - \frac{7}{3}$.

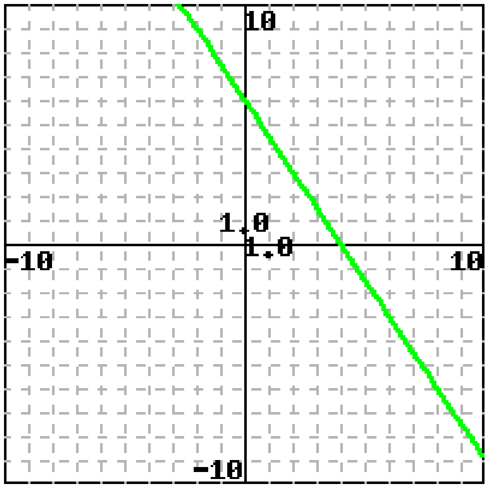
6. The slope is given by $m = \frac{-3-3}{5-(-1)} = -1$. From one point on the line, $-3 = -1(5) + b$, so $b = 2$. Thus, $y = -x + 2$.

7. The slope of the line perpendicular to the line $y = 8x + 3$ is $m = -\frac{1}{8}$. From the given point, we have $5 = -\frac{1}{8}(4) + b$, so $b = \frac{11}{2}$. It follows that the equation of the line is $y = -\frac{1}{8}x + \frac{11}{2}$.

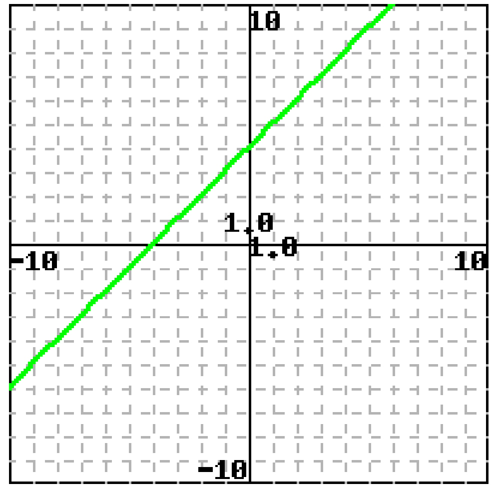
8. A line parallel to the line $y = 3x - 2$ has a slope $m = 3$. If it passes through the point $(6, 7)$, then $7 = 3(-6) + b$ or $b = 25$. It follows that the line satisfies $y = 3x + 25$. The perpendicular line has the slope $m_1 = -\frac{1}{3}$ with $7 = -\frac{1}{3}(-6) + b_1$ or $b_1 = 5$. Thus, the perpendicular line is given by $y = -\frac{1}{3}x + 5$.

9. The first line has the slope $m = \frac{8-(-6)}{-5-2} = -2$. From the point-slope form of the line, $y - 8 = -2(x - (-5))$ or $y = -2x - 2$. The perpendicular line has the slope $m_1 = \frac{1}{2}$. Since it passes through the origin, $b_1 = 0$, and the line is given by $y = \frac{x}{2}$.

10. The graph below on the left clearly passes through the points $(0, 6)$ and $(4, 0)$. It follows that the slope is $m = \frac{6-0}{0-4} = -\frac{3}{2}$. Since the y-intercept is 6, the equation for the line is $y = -\frac{3}{2}x + 6$.



Problem 10



Problem 11

11. The graph above on the right clearly passes through the points $(-4,0)$ and $(0,4)$. It follows that the slope is $m = \frac{0-4}{-4-0} = 1$. Since the y-intercept is 4, the equation for the line is $y = x + 4$.

12. 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.

13. It's a beautiful morning with a temperature of 24°C. We travel 8 km to a beautiful place to take a dive. The water temperature is 18°C with a breeze of 24 km per hour. We swim 366 m out to our dive spot where we submerge to a depth of 15 m. Among the animals that we see are 13 cm abalone, 36 cm lobsters, 5 cm banded gobies, and a 1.2 m leopard shark. At the end of the dive we surface 137 m from shore in 4.6 m of water. My tank gauge registers 49 kg/cm^2 of air remaining. (Note that metric countries often use SCUBA gauges in kg/square cm.)

14. 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 $\frac{108+121}{2} = 114.5$ cm. The growth is 13 cm in 2 years, so the average growth rate is 6.5cm/yr.

15. The height of a 6-year-old is 111 cm. This should be less accurate, because the line is a best fit over a large age range, while the estimate above is over a smaller range.

16. 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 $h = 135 + 6.46 \simeq 141.5$ cm. A similar calculation gives the girl at age 15 as having approximately a height of $h = 160 + 2(6.46) = 172.9$ 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.

17. 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 $N = \frac{0.31-0.08}{9} = 0.026$mg/ml

18. a. $k = 2.8$ and $b = 760$

b. $T = -271.4°$C

19. a. Let d be the date and C be the concentration of CO_2, then the linear model has the form, $C = kd + b$. 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 $C = 1.32d - 2275.1$ ppm.

b. This equation is used to estimate the level of CO_2 in 2000 and 1950. In 2000, $C = 1.32(2000) - 2275.1 = 364.9$ ppm. In 1950, $C = 1.32(1950) - 2275.1 = 298.9$ 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.

20. The equation is $T = -0.385d + 990.9$ secs, where T is the time for the mile and d is the date.

b. $d = 1950$.

c. $T = 220.9$ sec or 3 minutes 40.9 seconds.