Calculus I for Commerce Studies
Homework #2 (Sections 1.3 & 1.4)

Section 1.3

30. The equation of the circle with radius 3 and center (-2,-4) is given by
$$[x-(-2)]^2+(y+4)^2=9, \text{ or } (x+2)^2+(y+4)^2=9$$

31. The equation of the circle with radius 5 and center (0, 0) is given by
$$(x-0)^2+(y-0)^2=5^2, \text{ or } x^2+y^2=25$$

32. The distance between the center of the circle and the point (2,3) on the circumference of the circle is given by $d=\sqrt{(3-0)^2+(2-0)^2}=\sqrt{13}$.
Therefore $r=\sqrt{13}$ and the equation of the circle centered at the origin and passing through (2,3) is $x^2+y^2=13$.

33. The distance between the points (5,2) and (2,-3) is given by
$$d=\sqrt{(5-2)^2+(2-(-3))^2}=\sqrt{3^2+5^2}=\sqrt{34}.$$
Therefore $r=\sqrt{34}$ and the equation of the circle passing through (5,2) and (2,-3) is
$$(x-2)^2+[y-(-3)]^2=34, \text{ or } (x-2)^2+(y+3)^2=34.$$

40. Length of cable required on land: $d(S,Q)=10,000-x$
Length of cable required under water:
$$d(Q,M)=\sqrt{(x^2-0)+(0-3000)^2}=\sqrt{x^2+3000^2}$$
Cost of laying cable: $1.5(10,000-x)+2.5\sqrt{x^2+3000^2}$
If $x=2500$, then the total cost is given by
$$1.5(10000-2500)+2.5\sqrt{2500^2+3000^2}\approx 21,012.80, \text{ or } \$21,012.80.$$
If $x=3000$, then the total cost is given by
$$1.5(10000-3000)+2.5\sqrt{3000^2+3000^2}\approx 21,106.60, \text{ or } \$21,106.60.$$

41. a. Let the position of ship A and ship B after t hours be $A(0, y)$ and $B(x, 0)$, respectively. Then $x = 30t$ and $y = 20t$. Therefore, the distance between the two ships is $D=\sqrt{(30t)^2+(20t)^2}=\sqrt{900t^2+400t^2}=10\sqrt{13}t$.
b. The required distance is obtained by letting $t=2$ giving $D=10\sqrt{13}(2)$ or approximately 72.11 miles.

Section 1.4

7. Referring to the figure shown in the text, we see that $m = \dfrac{2-0}{0-(-4)} = \dfrac{1}{2}$.

8. Referring to the figure shown in the text, we see that $m = \dfrac{4-0}{0-2} = -2$.

9. This is a vertical line, and hence its slope is undefined.

10. This is a horizontal line, and hence its slope is 0.

45. We first write the equation $2x - 4y - 8 = 0$ in slope- intercept form:

$$2x - 4y - 8 = 0$$
$$4y = 2x - 8$$
$$y = \tfrac{1}{2}x - 2$$

Now the required line is parallel to this line, and hence has the same slope. Using the point-slope form of an equation of a line with $m = 1/2$ and the point $(-2, 2)$, we have

$$y - 2 = \tfrac{1}{2}[x - (-2)]$$
$$y = \tfrac{1}{2}x + 3.$$

46. We first write the equation $3x + 4y - 22 = 0$ in slope-intercept form:

$$3x + 4y - 22 = 0;\ 4y = -3x + 22, \text{ and } y = -\tfrac{3}{4}x + \tfrac{22}{4}.$$

Now the required line is perpendicular to this line, and hence has slope 4/3 (the negative reciprocal of $-3/4$). Using the point-slope form of an equation of a line with $m = 4/3$, and the point (2,4), we have

$$y - 4 = \tfrac{4}{3}(x - 2) \text{ and } y = \tfrac{4}{3}x + \tfrac{4}{3}.$$

54. Since the point (2,–3) lies on the line $-2x + ky + 10 = 0$, it satisfies the equation. Substituting $x = 2$ and $y = -3$ into the equation gives

$$-2(2) + (-3)k + 10 = 0;\ -4 - 3k + 10 = 0;\ -3k = -6, \text{ and } k = 2.$$

61. Since the line passes through the points $(a, 0)$ and $(0, b)$, its slope is $m = \frac{b-0}{0-a} = -\frac{b}{a}$. Then, using the point-slope form of an equation of a line with the point $(a, 0)$ we have

$$y - 0 = -\frac{b}{a}(x - a)$$

$$y = -\frac{b}{a}x + b$$

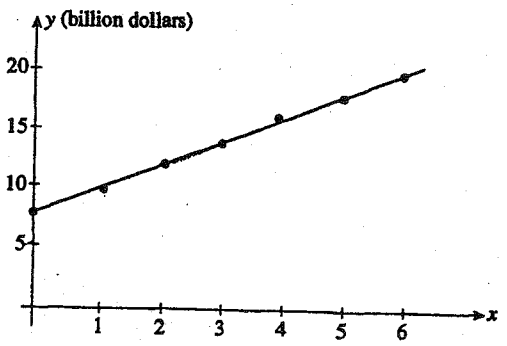
which may be written in the form $\frac{b}{a}x + y = b$.

Multiplying this last equation by $1/b$, we have $\frac{x}{a} + \frac{y}{b} = 1$.

62. Using the equation $\frac{x}{a} + \frac{y}{b} = 1$ with $a = 3$ and $b = 4$, we have $\frac{x}{3} + \frac{y}{4} = 1$. Then

$$4x + 3y = 12;\ 3y = 12 - 4x;\ y = -\frac{4}{3}x + 4.$$

75. a. – b.



c. $m = \frac{18.8 - 7.9}{6 - 0} \approx 1.82$, $y - 7.9 = 1.82(x - 0)$, or $y = 1.82x + 7.9$.

d. $y = 1.82(5) + 7.9 \approx 17$ or \$17 billion; This agrees with the actual data for that year.