

§ 1.10

2-36 (even), 42 - 52 (even), 54, 56, 60, 68

Solutions

1 - 8 Find the slope of the line through P and Q .

2) $P(0,0)$, $Q(2,-6)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6 - 0}{2 - 0} = \frac{-6}{2} = \boxed{-3.}$$

4) $P(1,2)$, $Q(3,3)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 2}{3 - 1} = \boxed{\frac{1}{2}.}$$

6) $P(2,-5)$, $Q(-4,3)$

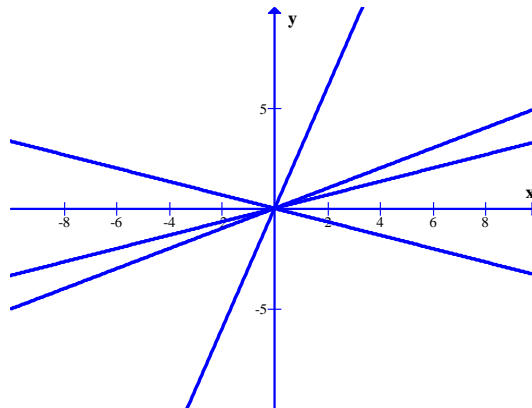
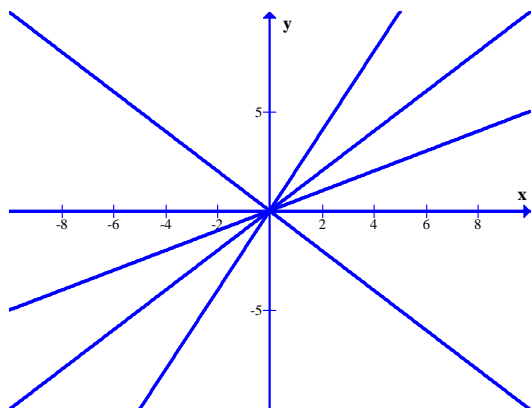
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - (-5)}{-4 - 2} = \frac{3 + 5}{-6} = \frac{8}{-6} = \boxed{-\frac{4}{3}.}$$

8) $P(-1,-4)$, $Q(6,0)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - (-4)}{6 - (-1)} = \boxed{\frac{4}{7}.}$$

10) (a) Sketch lines through $(0,0)$ with slopes $1, 0, \frac{1}{2}, 2,$ and -1 .

(b) Sketch lines through $(0,0)$ with slopes $\frac{1}{3}, \frac{1}{2}, -\frac{1}{3},$ and 3 .

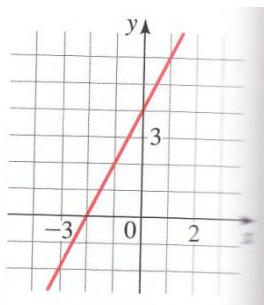


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11 – 14 Find an equation for line whose graph is sketched.

12)



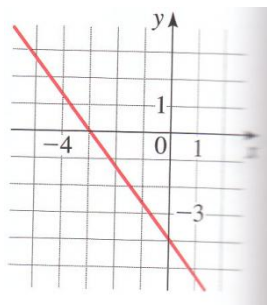
The line passes through the points $(-2, 0)$ and $(0, 4)$, thus its slope is given by

$$m = \frac{4 - 0}{0 - (-2)} = \frac{4}{2} = 2.$$

The slope-intercept form of the line is therefore given by

$$y = 2x + 4.$$

14)



The line passes through the points $(-3, 0)$ and $(0, -4)$, thus its slope is given by

$$m = \frac{-4 - 0}{0 - (-3)} = -\frac{4}{3}.$$

The slope-intercept form of the line is therefore given by

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

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15 – 34 Find an equation of the line that satisfies the given conditions.

16) Through $(-2,4)$; slope -1

$$y - 4 = -1(x + 2)$$

18) Through $(-3,-5)$; slope $-\frac{7}{2}$

$$y + 5 = -\frac{7}{2}(x + 3)$$

20) Through $(-1,-2)$ and $(4,3)$

$$m = \frac{3 - (-2)}{4 - (-1)} = \frac{5}{5} = 1$$

$$y + 2 = x + 1$$

22) slope $\frac{2}{5}$; y-intercept 4

$$y = \frac{2}{5}x + 4$$

24) x-intercept -8 ; y-intercept 6

This line passes through the points $(-8,0)$ and $(0,6)$

$$m = \frac{6 - 0}{0 - (-8)} = \frac{6}{8} = \frac{3}{4}$$

$$y = \frac{3}{4}x + 6$$

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26) Through (4,5); parallel to x-axis.

Parallel to x-axis means $m = 0$, so the line is horizontal.

$$y = 5$$

28) y-intercept 6; parallel to the line $2x+3y+4=0$

The line $2x + 3y + 4 = 0$ written in slope-intercept form becomes

$$y = -\frac{2}{3}x - \frac{4}{3}$$

So the slope of any parallel line will be $m = -\frac{2}{3}$.

$$y = -\frac{2}{3}x + 6$$

30) Through (2,6); perpendicular to the line $y = 1$

The line $y = 1$ is horizontal, so any line perpendicular to it must be vertical.

$$x = 2$$

32) Through (1,7); perpendicular to the line $4x - 8y = 1$

The line $4x - 8y = 1$ written in slope-intercept form becomes

$$y = -\frac{1}{2}x - \frac{1}{8}$$

So the slope of any perpendicular line will be $m = 2$.

$$y - 7 = 2(x - 1)$$

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34) Through $(-2,-11)$; perpendicular to the line passing through $(1,1)$ and $(5,-1)$

The line passing through $(1,1)$ and $(5,-1)$ has slope

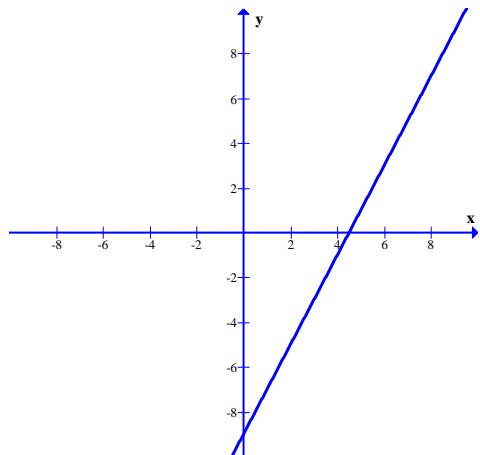
$$m = \frac{-1 - 1}{5 - 1} = -\frac{2}{4} = -\frac{1}{2}.$$

So the slope of any perpendicular line will be $m = 2$.

$$y + 11 = 2(x + 2)$$

36) (a) Sketch the line with slope -2 that passes through the point $(4,-1)$.

(b) Find an equation for this line.



$$y + 1 = -2(x - 4)$$

41 – 52 Find the slope and y-intercept of the line and draw its graph

42) $3x - 2y = 12$

Re-writing in slope-intercept form, we get

$$y = \frac{3}{2}x - 6$$

$$\text{Slope } \frac{3}{2}; \text{ y-intercept } -6$$

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44) $2x - 5y = 0$

Re-writing in slope-intercept form, we get

$$y = \frac{2}{5}x$$

Slope $\frac{2}{5}$; y-intercept 0

46) $-3x - 5y + 30 = 0$

Re-writing in slope-intercept form, we get

$$y = -\frac{3}{5}x + 6$$

Slope $-\frac{3}{5}$; y-intercept 6

48) $4y + 8 = 0$

Re-writing in slope-intercept form, we get

$$y = -2$$

Slope 0; y-intercept -2

50) $x = -5$

Undefined slope; no y-intercept

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52) $4x + 5y = 10$

Re-writing in slope intercept form, we get

$$y = -\frac{4}{5}x + 2$$

Slope $-\frac{4}{5}$; y-intercept 2

54) Use slopes to show that A(-3,-1), B(3,3), and C(-9,8) are vertices of a right triangle.

The slope of the line passing through A and B is

$$M_{AB} = \frac{3 - (-1)}{3 - (-3)} = \frac{4}{6} = \frac{2}{3}$$

The slope of the line passing through B and C is

$$M_{BC} = \frac{8 - 3}{-9 - 3} = -\frac{5}{12}$$

The slope of the line passing through C and A is

$$M_{CA} = \frac{8 - (-1)}{-9 - (-3)} = -\frac{9}{6} = -\frac{3}{2}$$

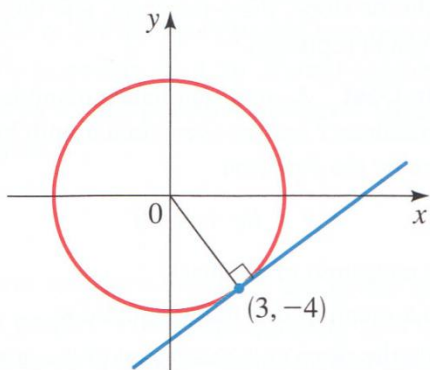
Since $M_{AB}M_{CA} = -1$, we conclude that that the lines AB and CA are perpendicular. Thus the points A, B, and C are the vertices of a right triangle.

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60) (a) Find an equation for the line tangent to the circle $x^2 + y^2 = 25$ at the point $(3, -4)$.

(b) At what other point on the circle will the tangent line be parallel to the tangent line in part (a)?



The line passing through the origin and the point $(3, -4)$ has slope

$$m = -\frac{4}{3}$$

Any line perpendicular to this line will have slope $m = \frac{3}{4}$.

(a) $y + 4 = \frac{3}{4}(x - 3)$

(b) $(-3, 4)$

68) Depreciation

A small business buys a computer for \$4000. After 4 years the value of the computer is expected to be \$200. For accounting purposes, the business uses linear depreciation to assess the value of the computer at a given time. This means that if V is the value of the computer at time t , then a linear equation is used to relate V and t .

- (a) Find a linear equation that relates V and t .
- (b) Sketch a graph of this linear equation.
- (c) What do the slope and V -intercept of the graph represent?
- (d) Find the depreciated value of the computer 3 years from the date of purchase.

(a) We know that the line representing the depreciated value of the computer will pass through the points $(0,4000)$ and $(4,200)$. Thus the slope of this line is

$$m = \frac{200 - 4000}{4} = -950.$$

So the equation of the line, in slope-intercept form is

$$V = -950t + 4000.$$

- (b) Sketch of graph not given here
- (c) the slope $m = -950$ means that the computer's value is decreasing at a rate of \$950 per year. The V -intercept represents purchase price of the computer.
- (d) When $t = 3$, we have

$$V = -950(3) + 4000 = -2850 + 4000 = \boxed{\$1150}$$