1. Find the equation of a line with the given slope and passing through the given point, P.

a) $m = 1, P(3, 5)$

$y = mx + b$
$5 = 1(3) + b$
$5 = 3 + b$
$5 - 3 = b$
$2 = b$

$\boxed{y = 1x + 2}$

b) $m = -3, P(0, -4)$

$y = mx + b$
$-4 = -3(0) + b$
$-4 = 0 + b$
$-4 = b$

$\boxed{y = -3x - 4}$

c) $m = \frac{2}{3}, P(-2, 6)$

$y = mx + b$
$6 = \frac{2}{3}(-2) + b$
$6 = \frac{-4}{3} + b$
$\frac{18}{3} + \frac{4}{3} = b$
$\frac{22}{3} = b$

$\boxed{y = \frac{2}{3}x + \frac{22}{3}}$

d) $m = \frac{-1}{2}, P(5, -2)$

$y = mx + b$
$-2 = \frac{-1}{2}(5) + b$
$-2 = \frac{-5}{2} + b$
$\frac{-4}{2} + \frac{5}{2} = b$
$\frac{1}{2} = b$

$\boxed{y = \frac{-1}{2}x + \frac{1}{2}}$

e) $m = -\frac{4}{5}, P(0, 0)$

$y = mx + b$
$0 = \frac{-4}{5}(0) + b$
$0 = 0 + b$
$0 = b$

$\boxed{y = \frac{-4}{5}x}$

f) $m = 2, P(\frac{1}{2}, \frac{3}{4})$

$y = mx + b$
$\frac{3}{4} = 2(\frac{1}{2}) + b$
$\frac{3}{4} = \frac{2}{2} + b$
$\frac{3}{4} - \frac{4}{4} = b$
$\frac{-1}{4} = b$

$\boxed{y = 2x - \frac{1}{4}}$

2. Find the equation of a line:
a) with a slope of -3, passing through the origin

$y = mx + b$
$0 = -3(0) + b$
$0 = 0 + b$
$0 = b$

$\boxed{y = -3x}$

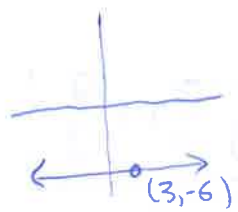b) Parallel to $y = \frac{2}{3}x + 5$, passing through (4, -5)

$// m = \frac{2}{3}$

Point : $(4, -5)$
      $x \quad y$

$y = mx + b$

$-5 = \frac{2}{3}(4) + b$

$-5 = \frac{8}{3} + b$

$-\frac{15}{3} - \frac{8}{3} = b$

$-\frac{23}{3} = b$

$$y = \frac{2}{3}x - \frac{23}{3}$$

c) Parallel to the x-axis, passing through (3, -6)

∵ It is a horizontal line.

(3,-6)

$$y = -6$$

d) Perpendicular to $y = -\frac{2}{5}x + 4$, passing through the origin

$\perp m = \frac{5}{2}$

$P(0,0)$
 $x \quad y$
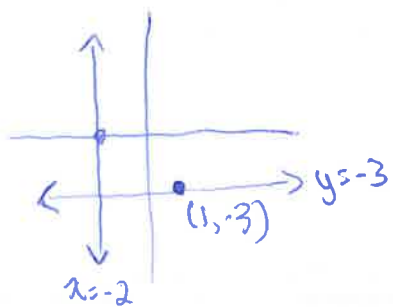
$y = mx + b$

$0 = \frac{5}{2}(0) + b$

$0 = 0 + b$

$0 = b$

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

e) Perpendicular to $x = -2$, passing through the point (1, -3)

$\uparrow$
vertical line

Perpendicular to a vertical line is a horizontal line.

$y = -3$
(1,-3)
$x = -2$

$$y = -3$$

f) Perpendicular to $y = 4x - 3$, passing through the point (-2, 7)

$\perp m = \frac{-1}{4}$

$P(-2,7)$
  $x \quad y$

$y = mx + b$

$7 = \left(\frac{-1}{4}\right)(-2) + b$

$7 = \frac{2}{4} + b$

$7 = \frac{1}{2} + b$

$\frac{14}{2} - \frac{1}{2} = b$

$\frac{13}{2} = b$

$$y = -\frac{1}{4}x + \frac{13}{2}$$

3. In Niagara-on-the-Lake, you can ride a horse-drawn carriage for a fixed price plus a variable amount that depends on the length of the trip. The variable cost is $10/km and a 2.5-km trip costs $40.

Determine the equation relating cost, C, in dollars, and distance, d, in kilometers.

$m = 10$

$P(2.5, 40)$

$x \quad y$

$y = mx + b$

$40 = 10(2.5) + b$

$40 = 25 + b$

$15 = b$

$$y = 10x + 15$$

OR

$$C = 10d + 15$$
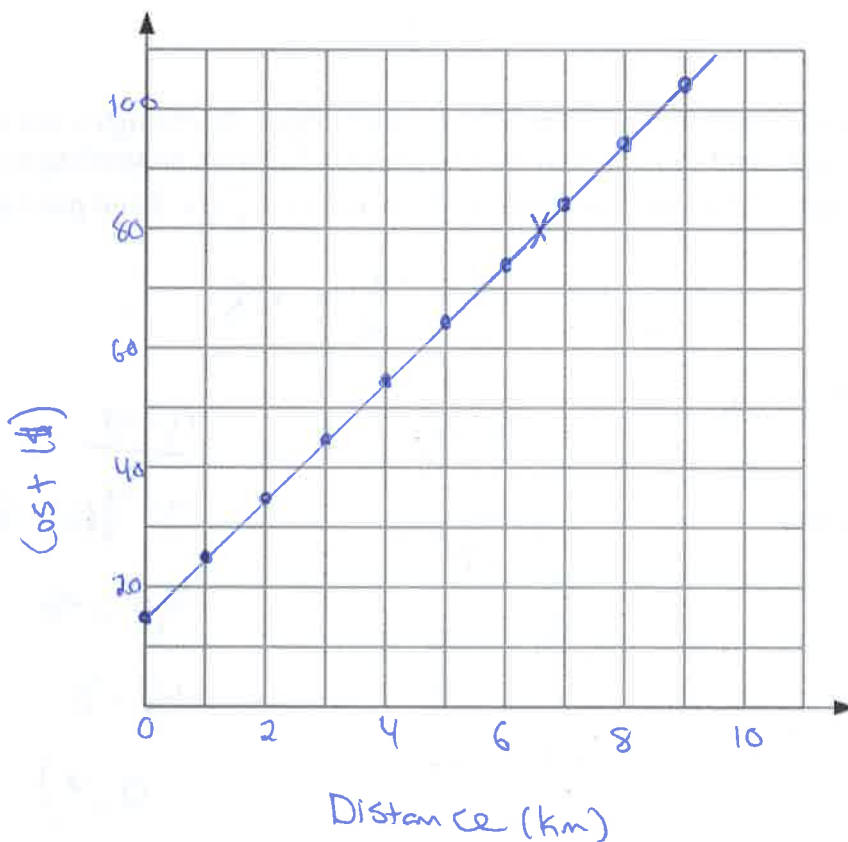
b) Use your equation to find the cost of a 6.5-km ride.

$C = 10(6.5) + 15$

$C = 65 + 15$

$C = \$80$

$\$80$

c) Graph this relation

Cost ($)

Distance (km)

d) Use your graph to find the cost of a 6.5 km ride.

$\$80$

4. Find an equation for the line parallel to $2x - 3y + 6 = 0$, with the same y-intercept as $y = 7x - 1$.

$2x - 3y + 6 = 0$

$-3y = -2x - 6$

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

$$\boxed{y = \frac{2}{3}x - 1}$$

$\parallel m = \frac{2}{3}$

$b = -1$

5. Find an equation for the line perpendicular to $4x - 5y = 20$ and sharing the same y-intercept.

$4x - 5y = 20$

$-5y = -4x + 20$

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

$$\boxed{y = \frac{-5}{4}x - 4}$$

$\perp m = -\frac{5}{4} \quad b = -4$

6. Jean's home city is one of the best designed in North America for traffic flow, Traffic lights are carefully programmed to keep cars moving. Some lanes on one-way streets change direction depending on the time of day. Find the x- and y-intercepts of the line that is perpendicular to $y = \frac{9}{8}x + 1$ and passes through the point (18, -8).

$\perp m = \frac{-8}{9}$

$P(18, -8)$

$x \quad y$

$y = mx + b$

$-8 = \left(\frac{-8}{9}\right)\left(\overset{2}{\cancel{18}}\right) + b$

$-8 = -16 + b$

$-8 + 16 = b$

$8 = b$

$$y = \frac{-8}{9}x + 8$$

x-int

$0 = \frac{-8}{9}x + 8$

$-8 = \frac{-8x}{9}$

$\frac{-72}{-8} = \frac{-8x}{-8}$

$9 = x$

$(9, 0)$

y-int

$y = \frac{-8}{9}(0) + 8$

$y = 0 + 8$

$y = 8$

$(0, 8)$

7. Aki has been driving at an average speed of 80 km/h toward Ottawa for 3 hours, when he sees the sign shown.

Ottawa 300 km

The equation relating distance and time is of the form $d = mt + b$

a) What does the ordered pair (3, 300) mean?

hours   km from Ottawa

b) The slope is $m = -80$. What does this value represent? Why is it negative?

Each hour driven, Aki gets 80km closer to Ottawa.

c) Determine the value of b.

$$y = mx + b$$
$$300 = -80(3) + b$$
$$300 = -240 + b$$
$$540 = b$$

d) Write an equation relating distance and time.

$$y = -80x + 540$$
$$d = -80t + 540$$

e) How long will the trip to Ottawa take, in total?

$$0 = -80t + 540$$
$$\frac{-540}{-80} = \frac{-80t}{-80}$$
$$t = 6.75 \text{ hours}$$

m

x y
$(6, 22)$

8. A city taxi charges \$2.50/km plus a fixed cost. A 6-km taxi ride costs \$22.

a) Find the fixed cost. (b)

$$y = mx + b$$
$$22 = 2.5(6) + b$$
$$22 = 15 + b$$
$$7 = b$$

b) Write the equation relating cost, C, in dollars, and distance, d, in kilometers.

$$C = 2.5d + 7$$

Answers

1. a) $y = x + 2$ b) $y = -3x - 4$ c) $y = \frac{2}{3}x + \frac{22}{3}$

d) $y = -\frac{1}{2}x + \frac{1}{2}$ e) $y = -\frac{4}{5}x$ f) $y = 2x - \frac{1}{4}$

2. a) $y = -3x$ b) $y = \frac{2}{3}x - \frac{23}{3}$ c) $y = -6$

d) $y = \frac{5}{2}x$ e) $y = -3$ f) $y = -\frac{1}{4}x + \frac{13}{2}$

3. a) $C = 10d + 15$ b) \$80
c)

Horse-Drawn Carriage Ride (graph: Cost (\$) vs Distance (km))

d) \$80

4. $y = \frac{2}{3}x - 1$

5. $y = -\frac{5}{4}x - 4$

6. x-intercept 9 ; y-intercept 8

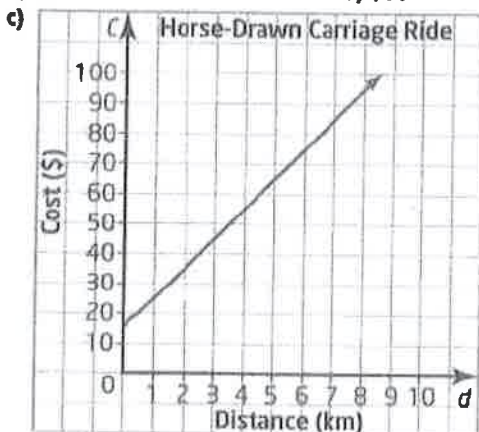**7.** a) After 3 hours of driving toward Ottawa, Aki has 300 km left to drive.
b) This value shows that for each hour that Aki drives, his distance from Ottawa decreases by 80 km. It is negative because it represents a decreasing distance per hour.
c) 540   d) $d = -80t + 540$ e) 6.75 hours

8. a) 7   b) $C = 2.5d + 7$