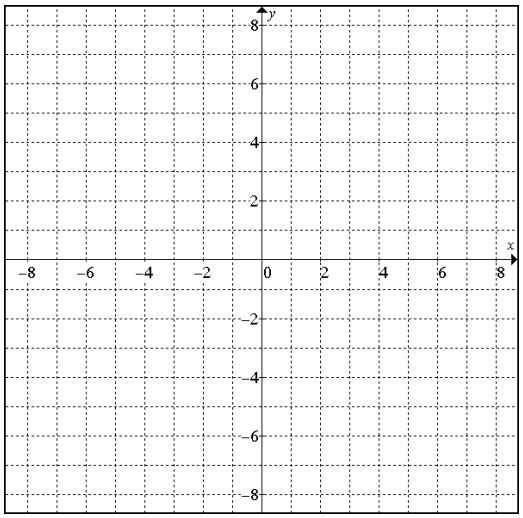
Mathematics 9

Determining Equations of Lines Algebraically

Date:

1. Graph the following lines on the same set of axes. Then state the equation of each line.



   a) through the point $A(-6,1)$ with a slope of $\frac{1}{2}$

   *Answer:*_____

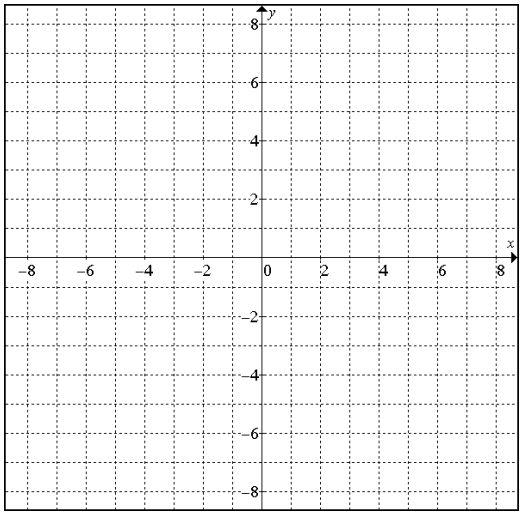
   b) through the point $B(3,1)$ with a slope of 3

   *Answer:*_____

   c) through the point $C(-8,8)$ and parallel to the line $y = -\frac{3}{4}x + 20$ *Answer:*_____

   d) through the point $D(6,2)$ and perpendicular to the line $y = -\frac{2}{3}x - 91$ *Answer:*_____

2. Graph the following lines on the same set of axes. Then state the equation of each line.



   a) through the points $A(5,2)$ and $B(1,-2)$

   *Answer:*_____

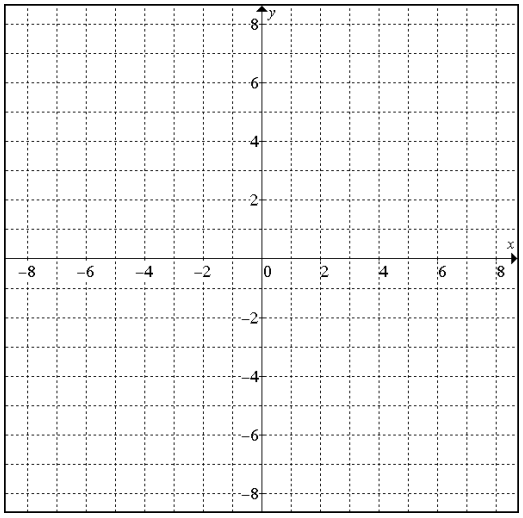
   b) through the points $C(-4,-3)$ and $D(2,-6)$

   *Answer:*_____

   c) with a y-intercept of 2 and passing through the point $E(-1,-1)$ *Answer:*_____

   d) with an x-intercept of -6 and passing through the point $F(3,-3)$ *Answer:*_____

3. Graph the following lines on the same set of axes. Then state the equation of each line.



   a) a vertical line through the point $A(2,3)$

   *Answer:*_____

   b) a line through the points $B(-4,-1)$; $C(6,-1)$

   *Answer:*_____

   c) through the point $C(-3,8)$ and parallel to the line $y = 5$ *Answer:*_____

   d) through the point $D(6,2)$ and perpendicular to the line $x = 0$ *Answer:*_____

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Example:

Determine the equation of the line through the point (–6,5) and perpendicular to the line $y = \frac{4}{3}x - 7$.

Solution:

The equation of the new line is of the form $y = -\frac{3}{4}x + b$

Since (–6,5) is **<u>on</u>** this line, it must **<u>satisfy</u>** its equation.

$5 = -\frac{3}{4}(-6) + b$

$5 = \frac{18}{4} + b$

$5 = \frac{9}{2} + b$ *or* $20 = 18 + 4b$

$5 - \frac{9}{2} = b$ $\quad$ $20 - 18 = 4b$

$\frac{10}{2} - \frac{9}{2} = b$ $\quad$ $2 = 4b$

$\frac{1}{2} = b$ $\quad$ $\frac{2}{4} = b$

$b = \frac{1}{2}$ $\quad$ $b = \frac{1}{2}$

$\therefore$ the equation of the line is $y = -\frac{3}{4}x + \frac{1}{2}$

***Without using a graph*, determine the equation of the line…**

4. a) through the point $(15,3)$ with a slope of $-\frac{4}{3}$
   b) through the point $(-6,2)$ with a slope of $-\frac{1}{3}$
   c) through the point $(3,2)$ and parallel to the line $y = 2x - 7$
   d) through the point $(-1,-5)$ and perpendicular to the line $y = -2x + 3$
   e) through $(1,1)$ and perpendicular to the line $y = -\frac{4}{3}x + 9$
   f) through $(2,-1)$ and parallel to the line $y = \frac{5}{3}x - \frac{3}{5}$
   g) parallel to the line $y = -x - 1$ with an *x*-intercept of 4 *(Hint: An x-intercept is a point!)*

5. a) through the points $(2,-4)$ and $(7,-19)$
   b) through the points $(-3,4)$ and $(-7,-10)$
   c) with an *x*-intercept of –2 and passing through $(2,7)$ *(Hint: An x-intercept is a point!)*
   d) with a *y*-intercept of 5 and passing through $(5,3)$
   e) with an *x*-intercept of 5 and a *y*-intercept of 3
   f) with the same *y*-intercept as $y = 3x - 4$ and with *x*-intercept 9.

6. a) through $(-2,-5)$ and parallel to $2x + y - 5 = 0$
   b) through $(7,-1)$ and perpendicular to $3x - y + 1 = 0$
   c) through $(-3,4)$ and parallel to $5x + 3y - 2 = 0$
   d) through $(4,-4)$ and parallel to $2x - 8y - 7 = 0$

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e) x-intercept 9 and perpendicular to $3x-6y+4=0$

f) y-intercept ¼ and perpendicular to $9x-4y+3=0$

7. a) with the same x-intercept as $3x-7y+12=0$ and parallel to $6x+8y-5=0$

b) with the same x-intercept as $y=-2x+10$ and perpendicular to $10x+4y+7=0$

c) with the same y-intercept as $3x+5y+20=0$ and through the point (–6,–1)

d) with the same y-intercept as $x+y+7=0$ and the same x-intercept as $5x-6y-60=0$

e) with the same x-intercept as $x-y-8=0$ and through the point (7,–4)

f) with x-intercept –2 and intersecting the line $x-3y+2=0$ when $x=-14$

8. The questions below should not need any calculations. Just fill in the blanks with the equation of …

a) a horizontal line through (7,8) _____

b) a line through the points (5,–6) and (5,8) _____

c) a line through the points (–1,–3) and (–2,–3) _____

d) a line parallel to the y-axis and with x-intercept 7 _____

e) a line parallel to the x-axis and through (–4,5) _____

f) a line perpendicular to $x=7$ and through (–2,–9) _____

g) a line parallel to $x=-1$ and through (12,17) _____

h) a line perpendicular to $y=0$ and through the origin _____

i) a line perpendicular to $y=2x+3$ and through the origin _____

Answers:

1. a) $y=\frac{1}{2}x+4$ b) $y=3x-8$ c) $y=-\frac{3}{4}x+2$ d) $y=\frac{3}{2}x-7$

2. a) $y=x-3$ b) $y=-\frac{1}{2}x-5$ c) $y=3x+2$ d) $y=-\frac{1}{3}x-2$

3. a) $x=2$ b) $y=-1$ c) $y=8$ d) $y=2$ 4a) $y=-\frac{4}{3}x+23$

4. b) $y=-\frac{1}{3}x$ c) $y=2x-4$ d) $y=\frac{1}{2}x-\frac{9}{2}$ e) $y=\frac{3}{4}x+\frac{1}{4}$ f) $y=\frac{5}{3}x-\frac{13}{3}$ g) $y=-x+4$

5. a) $y=-3x+2$ b) $y=\frac{7}{2}x+\frac{29}{2}$ c) $y=\frac{7}{4}x+\frac{7}{2}$ d) $y=-\frac{2}{5}x+5$ e) $y=-\frac{3}{5}x+3$ f) $y=\frac{4}{9}x-4$

6. a) $y=-2x-9$ b) $y=-\frac{1}{3}x+\frac{4}{3}$ c) $y=-\frac{5}{3}x-1$ d) $y=\frac{1}{4}x-5$ e) $y=-2x+18$ f) $y=-\frac{4}{9}x+\frac{1}{4}$

7. a) $y=-\frac{3}{4}x-3$ b) $y=\frac{2}{5}x-2$ c) $y=-\frac{1}{2}x-4$ d) $y=\frac{7}{12}x-7$ e) $y=4x-32$ f) $y=\frac{1}{3}x+\frac{2}{3}$

8. a) $y=8$ b) $x=5$ c) $y=-3$ d) $x=7$ e) $y=5$ f) $y=-9$ g) $x=12$ h) $x=0$ i) $y=-\frac{1}{2}x$