

The Linear Function

Remember the rule $y = mx + c$

1 Basics Consider the function below.

x	0	1	2	3	4	-1
y	-4	-2	0	2	4	-6
Difference pattern			2	2	2	2

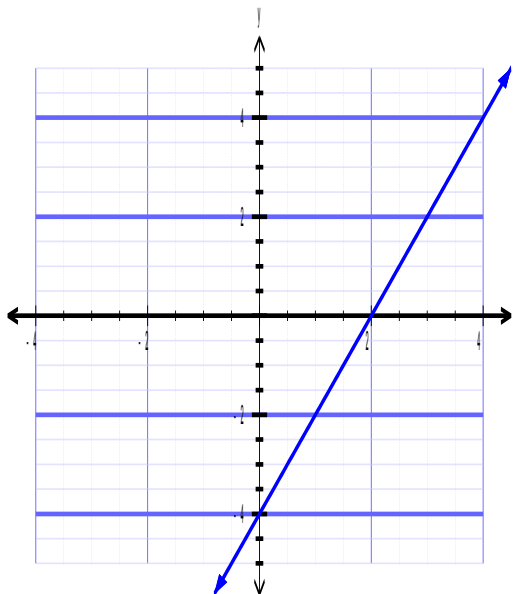
Notice if we put (-1, -6) in order at the beginning, the first difference is constant. In this case = 2 This is also the gradient. When $x = 0$, $y = -4$. This is the y-intercept. (Where the line crosses the y-axis.)

The function is then given by $y = 2x - 4$ which is graphed on the right. Notice that when $y = 0$ $x = 2$. This is the x- intercept.

Also the gradient m is given by rise / run Which is $4 / 2 = 2$

The DOMAIN (x – values) for this function is from -4 to 4 i.e. $-4 \leq x \leq 4$

The RANGE (y-values) for this function is from -5 to 5 i.e. $-5 \leq y \leq 5$



Consider the function below.

x	0	1	2	3	4	
y	4	2	0	-2	-4	
Difference Pattern			-2	-2	-2	-2

Notice that the line is drawn backwards. This means that the gradient is negative.

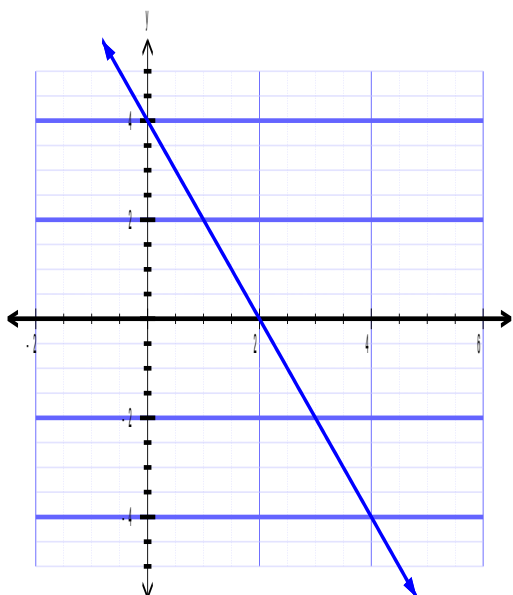
The function is given by $y = -2x + 4$ which is graphed on the right.

The gradient is -2 and the y-int = 4 Remember $y = mx + c$ Notice that when $y = 0$ $x = 2$. This is the x- intercept.

Also the gradient m is given by rise / run Or $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 0}{0 - 2} = -2$

The DOMAIN (x – values) for this function is from -2 to 6 i.e. $-2 \leq x \leq 6$

The RANGE (y-values) for this function is from -5 to 5 i.e. $-5 \leq y \leq 5$



- 2 Sketching a straight line E.G. Sketch the linear function $2x + y = 6$
- 3 Gradient of a straight line
- 4 Using the formula to find the gradient
- 5 Using $y = mx + c$
- 6 Using the x and y intercepts to sketch a straight line
- 7 Finding the equation of a straight line. Lines with zero gradient e.g. $y = 3$
Lines with infinite gradient e.g. $x = 2$
- 8 Find the distance between two points Using Pythagoras Using formula (THE SAME!)
- 9 Verifying if a point is on a straight line or not.
- 10 Solving Equations
- 11 Transforming Formulae
- 12 Solving simultaneous equations
- 13 Using variables other than x and y
- 14 Parallel and perpendicular lines (Note gradient) $m_1 \times m_2 = -1$ (Negative reciprocal) Flip change sign
- 15 Using CAS

WORK SHEET WITH LINEAR FUNCTIONS

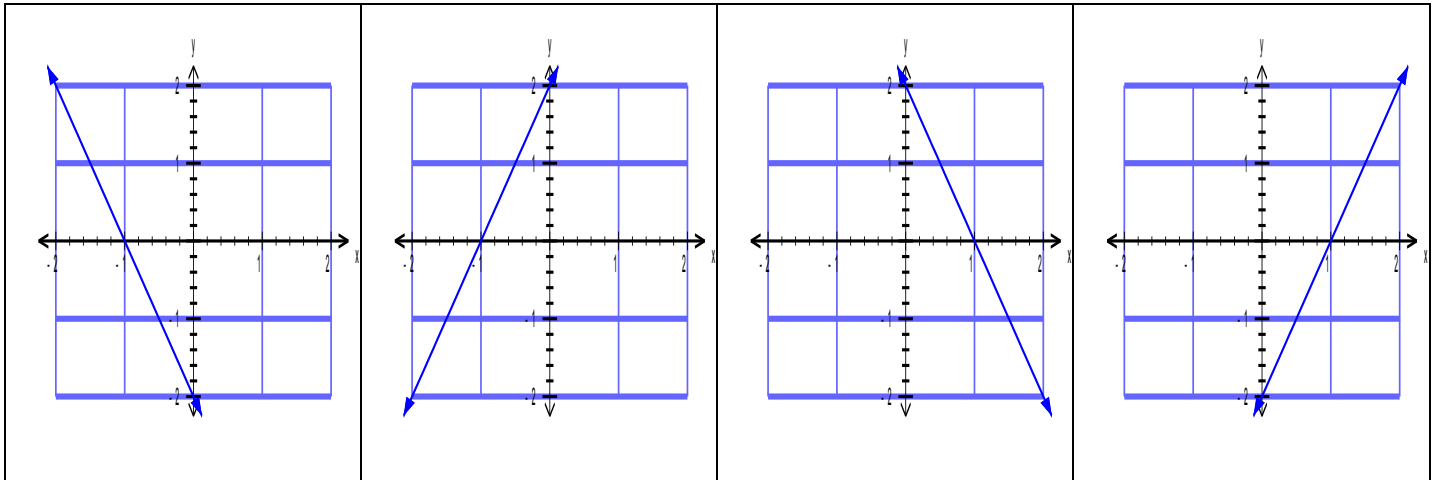
1 Match each of the linear equations with the correct graph.

a) $y = 2x + 2$

b) $y = 2x - 2$

c) $y = -2x + 2$

d) $y = -2x - 2$



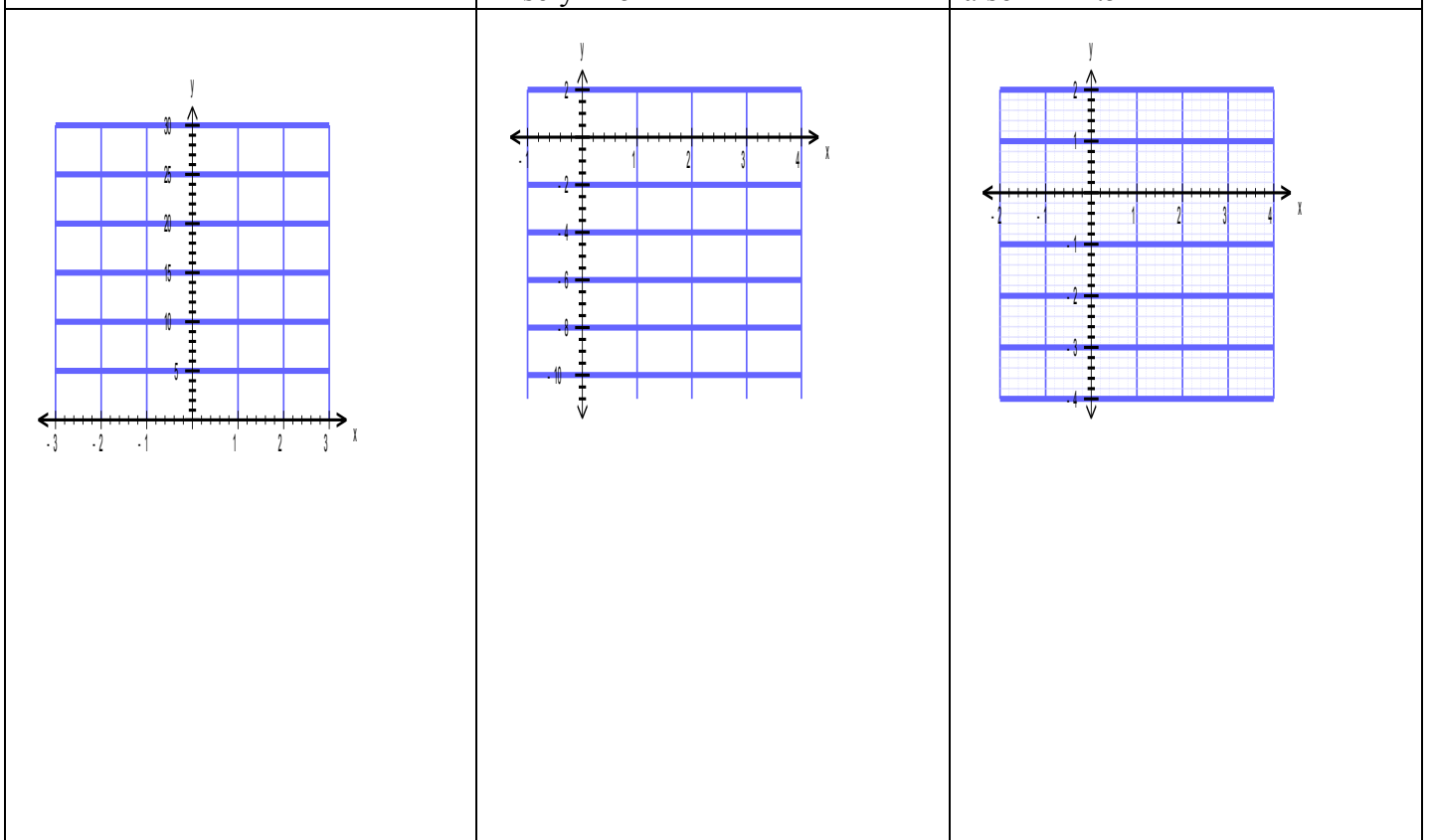
2 State the x and y intercepts for the functions drawn above.

3 Sketch the following equations for the domain stated by finding the intercepts. State the range for each.

a) $y = 5x + 15, \quad -3 \leq x \leq 3$

b) $y = -3x + 1, \quad -1 \leq x \leq 4$
Also $y = -5$

c) $2x + 5y = -10, \quad -2 \leq x \leq 4$
also $x = 2.5$



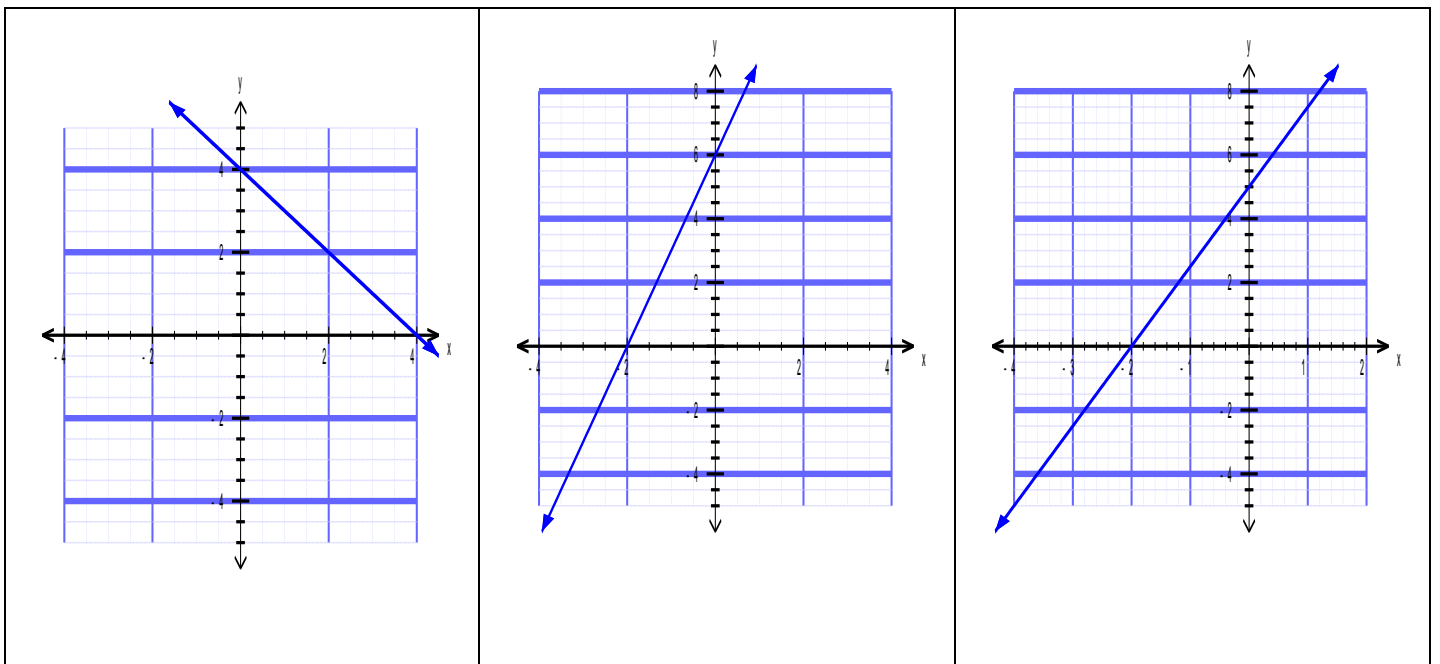
4 Find the gradient between each of the following pairs of points.

- a) A (2,7) B (5, 12) b) C (4, -2) D (-2, 6) c) E (0, 6) F (-1, -2) d) G (-3a, -5a) H (-a, 6a)

5 State the gradient, y intercept and x intercept for each of the following.

- a) $y = 4x + 8$ b) $y = -5x + 10$ c) $2x + 3y = 6$ d) $-2x - 4y = 8$ e) $2x + 3y = 5$

6 Find the equation of the following straight lines



7 Find the distance between the following pairs of points.

- a) L (2, 4) M (5, 8) b) A(2,7) B (1,5) c) C (-3, -4) D (-2, 6) d) E (-1, 2) F (4, 14)

8 Solve the following equations.

- a) $6 - 4x = -14$ b) $\frac{x}{3} + 9 = 8$ c) $3x - 9 = x + 7$ d) $\frac{2x-10}{4} = -2$ e) $3 - 2x = 7$

- f) $3(x - 1) = 12$ g) $2(2x + 3) + 2(x + 4) = 20$ h) $\frac{3x}{4} + 8 = 2$ j) $\frac{5-x}{2} = 1$ k) $\frac{4x+8}{5} = 4$

9 Transform the following formulae

a) Find B given $A = 5B - C$ b) Find B given $A = 5(2 - 3B)$ c) Find B $\frac{B-1}{A} = 5$

d) Find A given $\frac{5B-2}{A} = 3$ e) Find B $\frac{B-1}{A+2} = 5$ f) $\frac{2-3B}{A=1} = 2$

10 Solve simultaneously

a) $2x + y = 7$ $y = x + 1$ b) $2x - 3y = 12$ $y = 4 - 2x$ c) $3x + 4y = 10$ $y = 2x - 3$

d) $x + y = 4$ $x - y = 8$ e) $x + 4y = -6$ $2x - 3y = 10$ f) $6x + 5y = -35$ $5x - 2y = -23$

11 The sum of two numbers A and B is 1. If B is subtracted from twice A the result is 5. Find A and B.

12 The difference between A and B is 5. If B is added to twice A the result is 8. Find A and B.