FUNCTIONS

A DEFINITIONS

A.1 DETERMINING FUNCTIONS: LEVEL 1

MCQ 1: Consider the following calculation program:

1. Choose a number.
2. Add 2 to the chosen number.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☐ $f(x) = 2x$
- ☒ $f(x) = x + 2$
- ☐ $f(x) = x - 2$
- ☐ $f(x) = 2x + 2$

Answer: Given the following program:

1. Choose a number: x.
2. Add 2 to the chosen number: $x + 2$.

Thus, the function is:

$$f(x) = x + 2$$

MCQ 2: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by 3.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☒ $f(x) = 3x$
- ☐ $f(x) = x + 3$
- ☐ $f(x) = x - 3$
- ☐ $f(x) = 3x + 3$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by 3: $3x$.

Thus, the function is:

$$f(x) = 3x$$

MCQ 3: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by five.
3. Subtract 2 from the result obtained.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☐ $f(x) = 5x + 2$
- ☐ $f(x) = 5x^2 - 2$
- ☐ $f(x) = x - 2$
- ☒ $f(x) = 5x - 2$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by five: $5x$.
3. Subtract 2 from the result obtained: $5x - 2$.

Thus, the function is:

$$f(x) = 5x - 2$$

MCQ 4: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by -2.
3. Add 3 to the result obtained.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☒ $f(x) = -2x + 3$
- ☐ $f(x) = -2x - 3$
- ☐ $f(x) = 2x + 3$
- ☐ $f(x) = 2x - 3$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by -2: $-2x$.
3. Add 3 to the result obtained: $-2x + 3$.

Thus, the function is:

$$f(x) = -2x + 3$$

A.2 DETERMINING FUNCTIONS: LEVEL 2

MCQ 5: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by itself.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☐ $f(x) = 2x$
- ☐ $f(x) = x + 2$
- ☐ $f(x) = 2x^2$
- ☒ $f(x) = x^2$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by itself: $x \times x = x^2$.

Thus, the function is:

$$f(x) = x^2$$

MCQ 6: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by itself.
3. Subtract 3 from the product obtained.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☒ $f(x) = x^2 - 3$
- ☐ $f(x) = x - 3$
- ☐ $f(x) = x - 3x$
- ☐ $f(x) = x^2 + 3x$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by itself: $x \times x = x^2$.
3. Subtract 3 from the product obtained: $x^2 - 3$.

Thus, the function is:

$$f(x) = x^2 - 3$$

MCQ 7: Consider the following calculation program:

1. Choose a number.
2. Add 3 to the chosen number.
3. Multiply the result by the original chosen number.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☐ $f(x) = x + 3x$
- ☒ $f(x) = (x + 3)x$
- ☐ $f(x) = x(x + 3) + 3$
- ☐ $f(x) = 3x^2 + x$

Answer: Given the following program:

1. Choose a number: x.
2. Add 3 to the chosen number: $x + 3$.
3. Multiply the result by the original chosen number: $(x+3) \times x$.

Thus, the function is:

$$f(x) = (x + 3)x$$

MCQ 8: Consider the following calculation program:

1. Choose a number.
2. Add 4 to the chosen number.
3. Divide the result by the chosen number.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

Choose one answer:

- ☒ $f(x) = \frac{x+4}{x}$
- ☐ $f(x) = \frac{x+4}{2}$
- ☐ $f(x) = \frac{4}{x} + x$
- ☐ $f(x) = x + 4$

Answer: Given the following program:

1. Choose a number: x.
2. Add 4 to the chosen number: $x + 4$.
3. Divide the result by the original chosen number: $\dfrac{x+4}{x}$.

Thus, the function is:

$$f(x) = \frac{x+4}{x}$$

A.3 WRITING FUNCTIONS: LEVEL 1

Ex 9: Consider the following calculation program:

1. Choose a number.
2. Subtract 5 from the chosen number.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{x - 5}$$

Answer: Given the following program:

1. Choose a number: x.
2. Subtract 5 from the chosen number: $x - 5$.

Thus, the function is:

$$f(x) = x - 5$$

Ex 10: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by three.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{3x}$$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by three: $3x$.

Thus, the function is:

$$f(x) = 3x$$

Ex 11: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by five.
3. Subtract 2 from the result obtained.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{5x - 2}$$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by five: $5x$.
3. Subtract 2 from the result obtained: $5x - 2$.

Thus, the function is:

$$f(x) = 5x - 2$$

Ex 12: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by -2.
3. Add 5 to the result obtained.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{-2x + 5}$$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by -2: $-2x$.
3. Add 5 to the result obtained: $-2x + 5$.

Thus, the function is:

$$f(x) = -2x + 5$$

A.4 WRITING FUNCTIONS: LEVEL 2

Ex 13: Consider the following calculation program:

1. Choose a number.
2. Multiply the chosen number by itself.
3. Subtract 1 from the result obtained.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{x^2 - 1}$$

Answer: Given the following program:

1. Choose a number: x.
2. Multiply the chosen number by itself: x^2.
3. Subtract 1 from the result obtained: $x^2 - 1$.

Thus, the function is:

$$f(x) = x^2 - 1$$

Ex 14: Consider the following calculation program:

1. Choose a number.
2. Square the chosen number.
3. Multiply the result by 2.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{2x^2}$$

Answer: Given the following program:

1. Choose a number: x.
2. Square the chosen number: x^2.
3. Multiply the result by 2: $2x^2$.

Thus, the function is:

$$f(x) = 2x^2$$

Ex 15: Consider the following calculation program:

1. Choose a number.
2. Subtract 1 from the chosen number.
3. Multiply the result by the original number chosen.

Let x be the number chosen initially. Determine the function f that corresponds to the result obtained with this program.

$$f(x) = \boxed{(x - 1)x}$$

Answer: Given the following program:

1. Choose a number: x.
2. Subtract 1 from the chosen number: $x - 1$.
3. Multiply the result by the original number: $(x - 1)x$.

Thus, the function is:

$$f(x) = (x - 1)x$$

A.5 CALCULATING $f(x)$

Ex 16: For $f(x) = x + 3$,

$$f(4) = \boxed{7}$$

Answer:

$$\begin{aligned} f(4) &= (4) + 3 \quad \text{(substituting } x \text{ with } (4)\text{)} \\ &= 4 + 3 \\ &= 7 \end{aligned}$$

Ex 17: For $f(x) = 2x - 1$,

$$f(5) = \boxed{9}$$

Answer:

$$\begin{aligned} f(5) &= 2 \times (5) - 1 \quad \text{(substituting } x \text{ with (5))} \\ &= 10 - 1 \\ &= 9 \end{aligned}$$

Ex 18: For $f(x) = 3x + 2$,

$$f(2) = \boxed{8}$$

Answer:

$$\begin{aligned} f(2) &= 3 \times (2) + 2 \quad \text{(substituting } x \text{ with (2))} \\ &= 6 + 2 \\ &= 8 \end{aligned}$$

Ex 19: For $f(x) = x^2 - 1$,

$$f(3) = \boxed{8}$$

Answer:

$$\begin{aligned} f(3) &= (3)^2 - 1 \quad \text{(substituting } x \text{ with (3))} \\ &= 9 - 1 \\ &= 8 \end{aligned}$$

Ex 20: For $f(x) = 5x - 3$,

$$f(1) = \boxed{2}$$

Answer:

$$\begin{aligned} f(1) &= 5 \times (1) - 3 \quad \text{(substituting } x \text{ with (1))} \\ &= 5 - 3 \\ &= 2 \end{aligned}$$

Ex 21: For $f(x) = \frac{x}{2} + 4$,

$$f(6) = \boxed{7}$$

Answer:

$$\begin{aligned} f(6) &= \frac{(6)}{2} + 4 \quad \text{(substituting } x \text{ with (6))} \\ &= 3 + 4 \\ &= 7 \end{aligned}$$

Ex 22: For $f(x) = x - 5$,

$$f(10) = \boxed{5}$$

Answer:

$$\begin{aligned} f(10) &= (10) - 5 \quad \text{(substituting } x \text{ with (10))} \\ &= 10 - 5 \\ &= 5 \end{aligned}$$

Ex 23: For $f(x) = 2x - 5$,

$$f(-2) = \boxed{-9}$$

Answer:

$$\begin{aligned} f(-2) &= 2 \times (-2) - 5 \quad \text{(substituting } x \text{ with (}-2\text{))} \\ &= -4 - 5 \\ &= -9 \end{aligned}$$

Ex 24: For $f(x) = -x + 4$,

$$f(-3) = \boxed{7}$$

Answer:

$$\begin{aligned} f(-3) &= -(-3) + 4 \quad \text{(substituting } x \text{ with (}-3\text{))} \\ &= 3 + 4 \\ &= 7 \end{aligned}$$

Ex 25: For $f(x) = 3x - 7$,

$$f(-1) = \boxed{-10}$$

Answer:

$$\begin{aligned} f(-1) &= 3 \times (-1) - 7 \quad \text{(substituting } x \text{ with (}-1\text{))} \\ &= -3 - 7 \\ &= -10 \end{aligned}$$

Ex 26: For $f(x) = x^2 - 2x$,

$$f(-2) = \boxed{8}$$

Answer:

$$\begin{aligned} f(-2) &= (-2)^2 - 2 \times (-2) \quad \text{(substituting } x \text{ with (}-2\text{))} \\ &= 4 + 4 \\ &= 8 \end{aligned}$$

Ex 27: For $f(x) = 2x + 3$,

$$f(-3) = \boxed{-3}$$

Answer:

$$\begin{aligned} f(-3) &= 2 \times (-3) + 3 \quad \text{(substituting } x \text{ with (}-3\text{))} \\ &= -6 + 3 \\ &= -3 \end{aligned}$$

Ex 28: For $f(x) = \frac{x}{2} - 4$,

$$f(8) = \boxed{0}$$

Answer:

$$\begin{aligned} f(8) &= \frac{(8)}{2} - 4 \quad \text{(substituting } x \text{ with (8))} \\ &= 4 - 4 \\ &= 0 \end{aligned}$$

Ex 29: For $f(x) = \frac{3x-5}{2}$,

$$f(-1) = \boxed{-4}$$

Answer:

$$\begin{aligned} f(-1) &= \frac{3\times(-1)-5}{2} \quad \text{(substituting } x \text{ with } (-1)) \\ &= \frac{-3-5}{2} \\ &= \frac{-8}{2} \\ &= -4 \end{aligned}$$

Ex 30: For $f(x) = \frac{x-6}{2} - 3$,

$$f(10) = \boxed{-1}$$

Answer:

$$\begin{aligned} f(10) &= \frac{(10)-6}{2} - 3 \quad \text{(substituting } x \text{ with } (10)) \\ &= \frac{4}{2} - 3 \\ &= 2 - 3 \\ &= -1 \end{aligned}$$

B TABLES OF VALUES

B.1 FINDING $f(x)$

Ex 31: The table of values is given below:

x	-2	-1	0	1	2
$f(x)$	-1	0	1	2	3

$f(2) = \boxed{3}$

Answer: For $x = 2$, $f(2) = 3$.

Ex 32: The table of values is given below:

x	-3	-1	0	3	4
$f(x)$	5	3	0	1	4

$f(3) = \boxed{1}$

Answer: For $x = 3$, $f(3) = 1$.

Ex 33: The table of values is given below:

x	-4	-2	0	2	4
$f(x)$	2	1	-1	0	3

$f(0) = \boxed{-1}$

Answer: For $x = 0$, $f(0) = -1$.

Ex 34: The table of values is given below:

x	-5	-2	0	3	5
$f(x)$	4	2	-1	0	6

$f(5) = \boxed{6}$

Answer: For $x = 5$, $f(5) = 6$.

B.2 FILLING TABLES OF VALUES

Ex 35: For $f(x) = x^2$, fill in the table of values:

x	-2	-1	0	1	2
$f(x)$	$\boxed{4}$	$\boxed{1}$	$\boxed{0}$	$\boxed{1}$	$\boxed{4}$

Answer:

- $f(-2) = ((-2))^2 \quad \text{(substituting } x \text{ with } (-2))$
  $= 4$
- $f(-1) = ((-1))^2 \quad \text{(substituting } x \text{ with } (-1))$
  $= 1$
- $f(0) = (0)^2 \quad \text{(substituting } x \text{ with } (0))$
  $= 0$
- $f(1) = (1)^2 \quad \text{(substituting } x \text{ with } (1))$
  $= 1$
- $f(2) = (2)^2 \quad \text{(substituting } x \text{ with } (2))$
  $= 4$

So the table of values is:

x	-2	-1	0	1	2
$f(x)$	4	1	0	1	4

Ex 36: For $f(x) = -2x + 1$, fill in the table:

x	-2	-1	0	1	2
$f(x)$	$\boxed{5}$	$\boxed{3}$	$\boxed{1}$	$\boxed{-1}$	$\boxed{-3}$

Answer:

- $f(-2) = -2\times(-2)+1 \quad \text{(substituting } x \text{ with } (-2))$
  $= 4+1$
  $= 5$
- $f(-1) = -2\times(-1)+1 \quad \text{(substituting } x \text{ with } (-1))$
  $= 2+1$
  $= 3$
- $f(0) = -2\times(0)+1 \quad \text{(substituting } x \text{ with } (0))$
  $= 0+1$
  $= 1$
- $f(1) = -2\times(1)+1 \quad \text{(substituting } x \text{ with } (1))$
  $= -2+1$
  $= -1$
- $f(2) = -2\times(2)+1 \quad \text{(substituting } x \text{ with } (2))$
  $= -4+1$
  $= -3$

So the table of values is:

x	-2	-1	0	1	2
$f(x)$	5	3	1	-1	-3

Ex 37: For $f(x) = x^2 - 3x + 1$, fill in the table:

x	-2	-1	0	1	2
$f(x)$	$\boxed{11}$	$\boxed{5}$	$\boxed{1}$	$\boxed{-1}$	$\boxed{-1}$

Answer:

- $f(-2) = ((-2))^2 - 3 \times (-2) + 1$ (substituting x with (-2))
  $= 4 + 6 + 1$
  $= 11$
- $f(-1) = ((-1))^2 - 3 \times (-1) + 1$ (substituting x with (-1))
  $= 1 + 3 + 1$
  $= 5$
- $f(0) = (0)^2 - 3 \times (0) + 1$ (substituting x with (0))
  $= 0 + 0 + 1$
  $= 1$
- $f(1) = (1)^2 - 3 \times (1) + 1$ (substituting x with (1))
  $= 1 - 3 + 1$
  $= -1$
- $f(2) = (2)^2 - 3 \times (2) + 1$ (substituting x with (2))
  $= 4 - 6 + 1$
  $= -1$

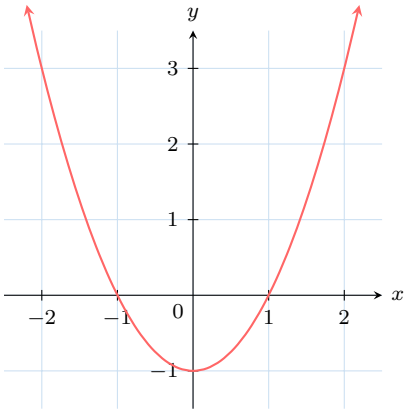
So the table of values is:

x	-2	-1	0	1	2
$f(x)$	11	5	1	-1	-1

C GRAPHS

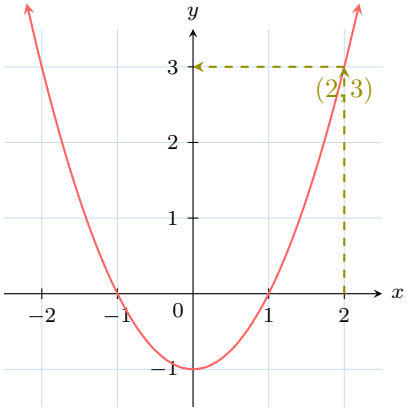
C.1 FINDING $f(x)$

Ex 38: The graph of $y = f(x)$ is:



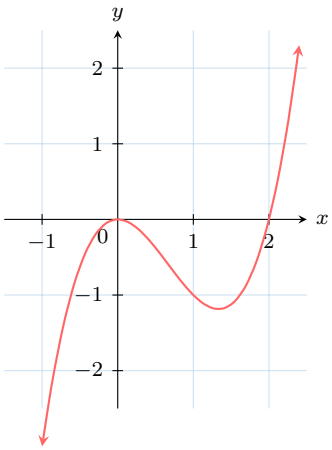
$f(2) = \boxed{3}$

Answer:



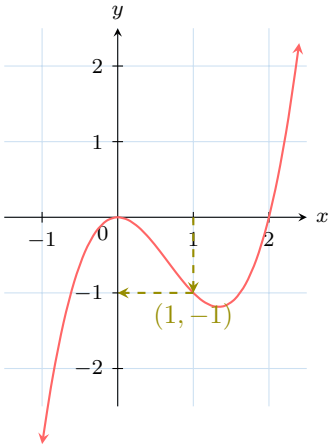
$f(2) = 3$

Ex 39: The graph of $y = f(x)$ is:



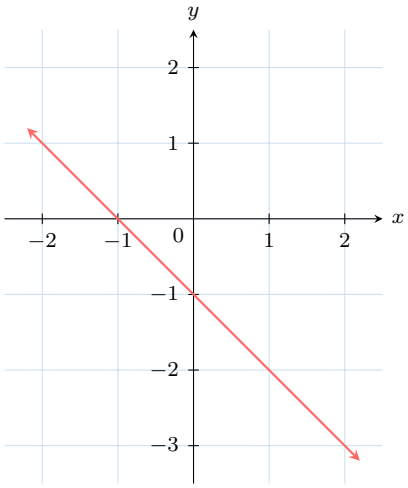
$f(1) = \boxed{-1}$

Answer:



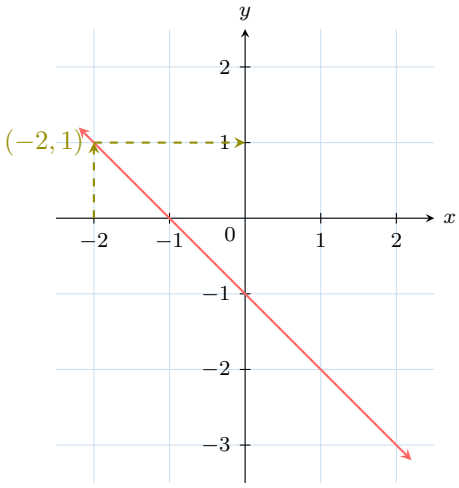
$f(1) = -1$

Ex 40: The graph of $y = f(x)$ is:



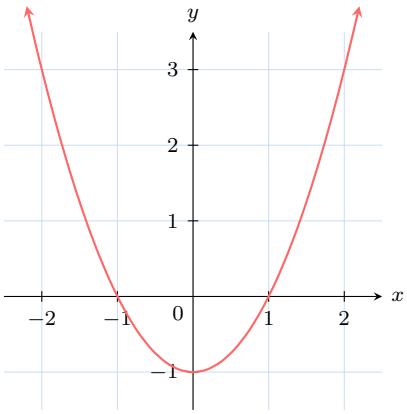
$f(-2) = \boxed{1}$

Answer:



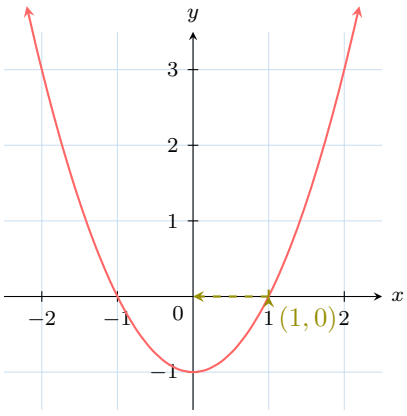
$f(-2) = 1$

Ex 41: The graph of $y = f(x)$ is:



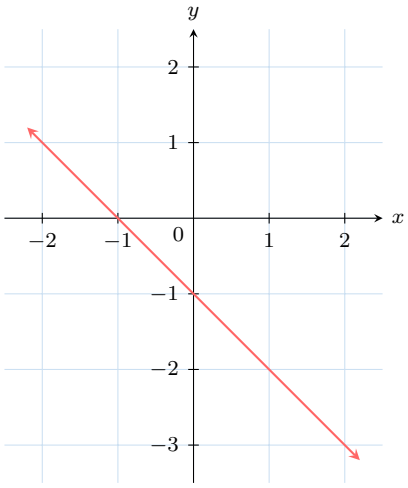
$f(1) =$ $\boxed{0}$

Answer:



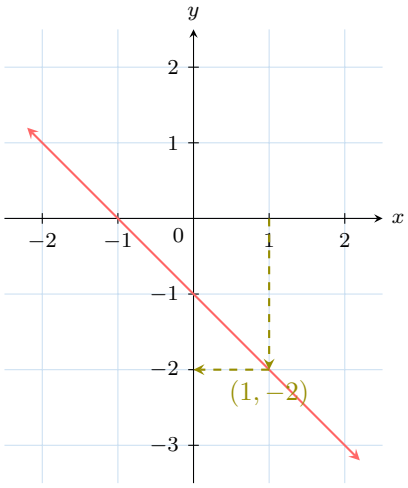
$f(1) = 0$

Ex 42: The graph of $y = f(x)$ is:



$f(1) =$ $\boxed{-2}$

Answer:



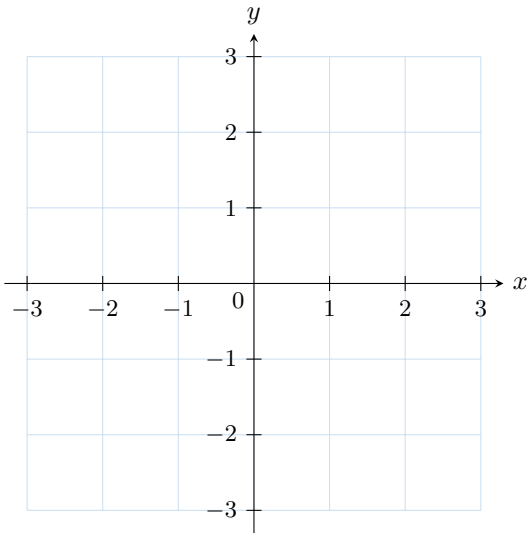
$f(1) = -2$

C.2 PLOTTING LINE GRAPHS

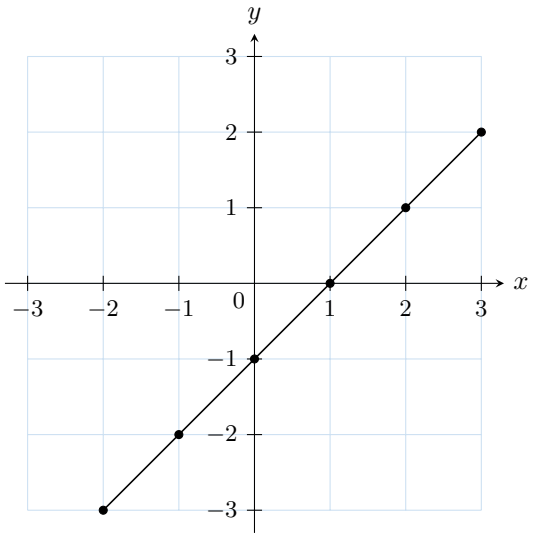
Ex 43: Here is a table of values for the function $f(x) = x - 1$:

x	-2	-1	0	1	2	3
$f(x)$	-3	-2	-1	0	1	2

Plot the line graph of f.



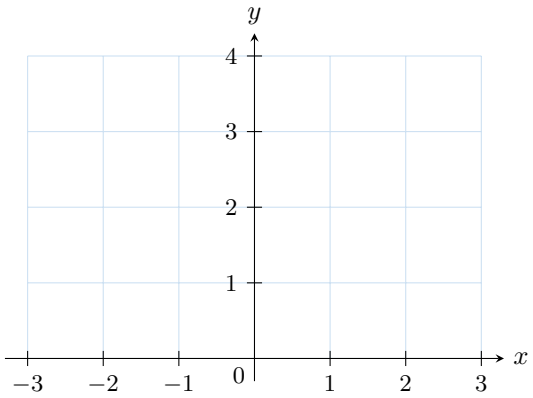
Answer: Plot the points $(-2,-3)$, $(-1,-2)$, $(0,-1)$, $(1,0)$, $(2,1)$, and $(3,2)$. Then, connect the points with straight segments to form the line graph.



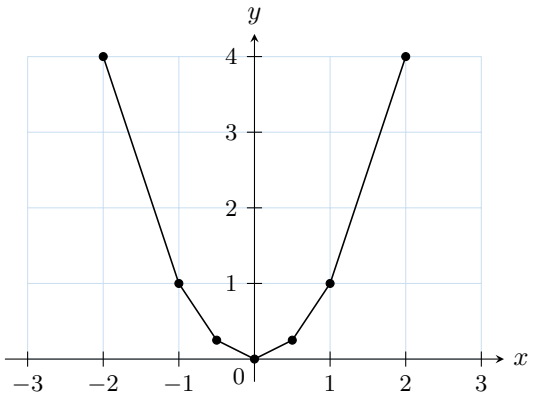
Ex 44: Here is a table of values for the function $f(x) = x^2$:

x	-2	-1	-0.5	0	0.5	1	2
$f(x)$	4	1	0.25	0	0.25	1	4

Plot the line graph of f.



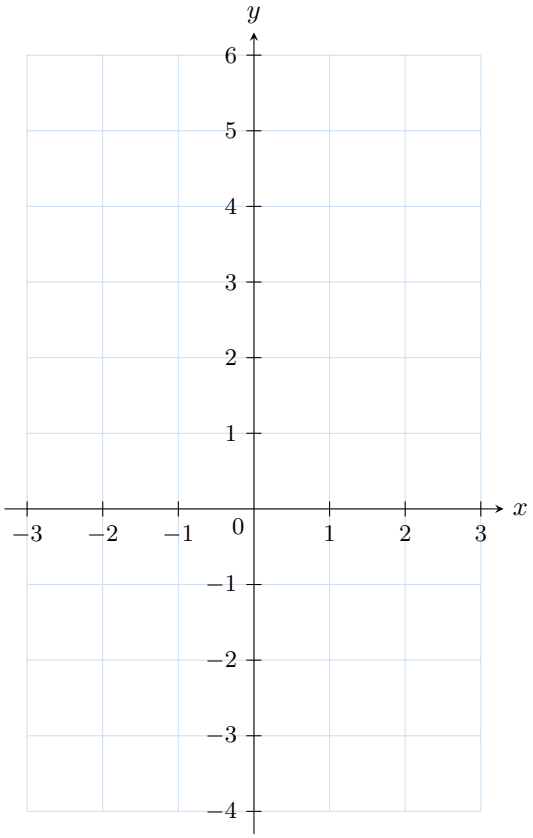
Answer: Plot the points $(-2,4)$, $(-1,1)$, $(-0.5,0.25)$, $(0,0)$, $(0.5,0.25)$, $(1,1)$, and $(2,4)$. Then, connect the points with straight segments.



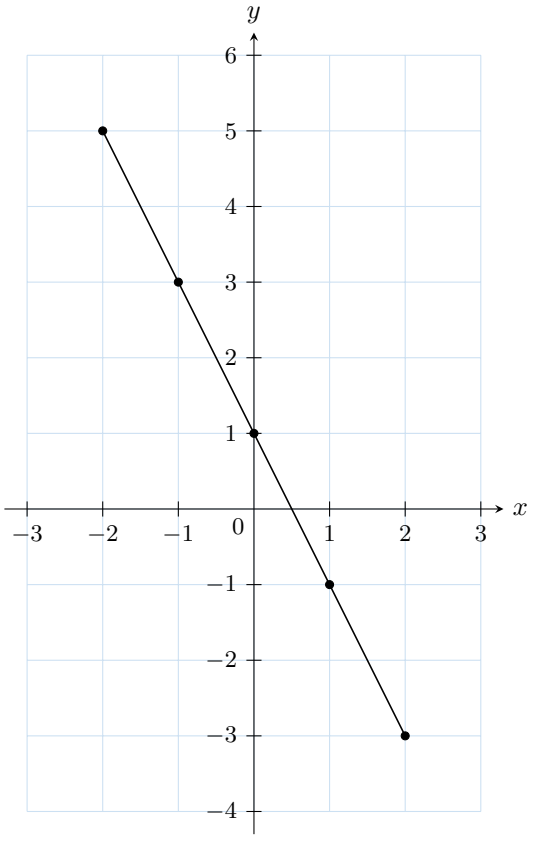
Ex 45: Here is a table of values for the function $f(x) = -2x+1$:

x	-2	-1	0	1	2
$f(x)$	5	3	1	-1	-3

Plot the line graph of f.



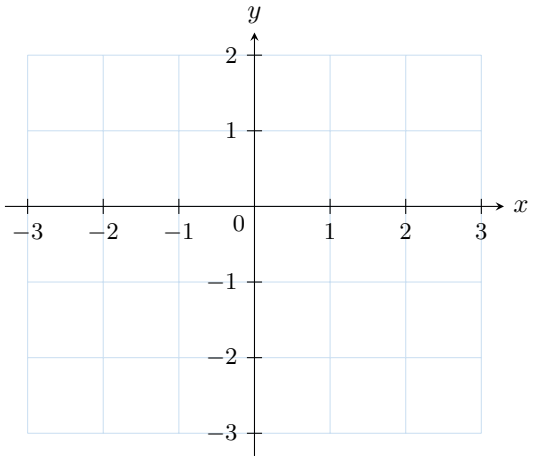
Answer: Plot the points $(-2,5)$, $(-1,3)$, $(0,1)$, $(1,-1)$, $(2,-3)$. Then, connect the points with straight segments to form the line graph.



Ex 46: Here is a table of values for the function $f(x) = 0.5x-1$:

x	-3	-2	-1	0	1	2	3
$f(x)$	-2.5	-2	-1.5	-1	-0.5	0	0.5

Plot the line graph of f.



Answer: Plot the points $(-3, -2.5)$, $(-2, -2)$, $(-1, -1.5)$, $(0, -1)$, $(1, -0.5)$, $(2, 0)$, $(3, 0.5)$. Then, connect the points with straight segments to form the line graph.