QUADRATIC FUNCTIONS

A DEFINITION

A.1 RECOGNIZING QUADRATIC FUNCTIONS

MCQ 1: Is $f(x) = 2x^2 - 3x + 2$ a quadratic function?

☐ Yes.

☐ No.

MCQ 2: Is $f(x) = 2x - 3$ a quadratic function?

☐ Yes.

☐ No.

MCQ 3: Is $f(x) = 2x^2 - 3x + \frac{1}{x}$ a quadratic function?

☐ Yes.

☐ No.

MCQ 4: Is $f(x) = (x-1)(x+2)$ a quadratic function?

☐ Yes.

☐ No.

A.2 CALCULATING $f(x)$

Ex 5: For $f : x \mapsto x^2 - 3x + 1$,

- $f(0) =$ ☐
- $f(2) =$ ☐
- $f\left(\frac{1}{2}\right) =$ ☐

Ex 6: For $f : x \mapsto (x-1)(x-2)$,

- $f(0) =$ ☐
- $f(2) =$ ☐
- $f\left(\frac{1}{2}\right) =$ ☐

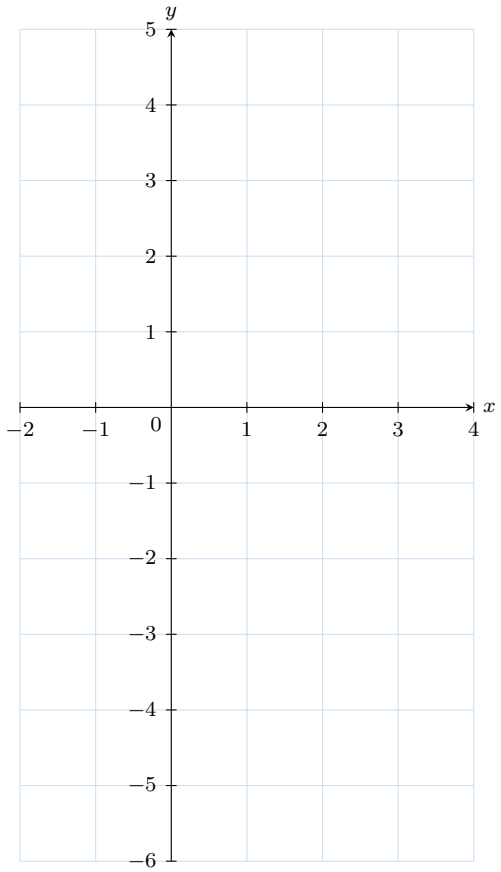
Ex 7: For $f : x \mapsto (x-2)^2 + 4$,

- $f(2) =$ ☐
- $f(1) =$ ☐
- $f(3) =$ ☐

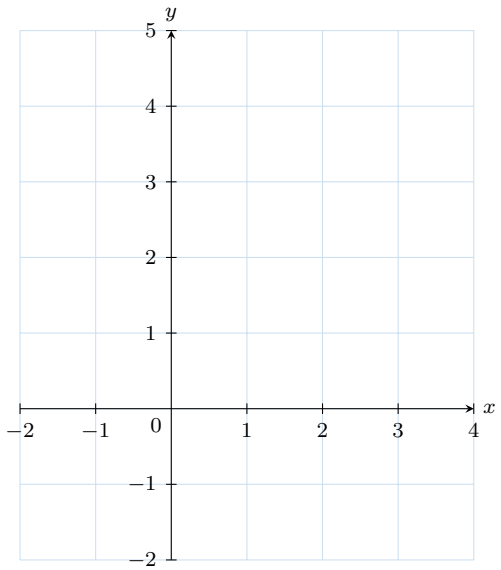
B GRAPH

B.1 PLOTTING GRAPHS

Ex 8: For the function $f(x) = -x^2+2x+3$, sketch the graph of f.(You may fill in a table of values for $x = -2, -1, 0, 1, 2, 3, 4$.)

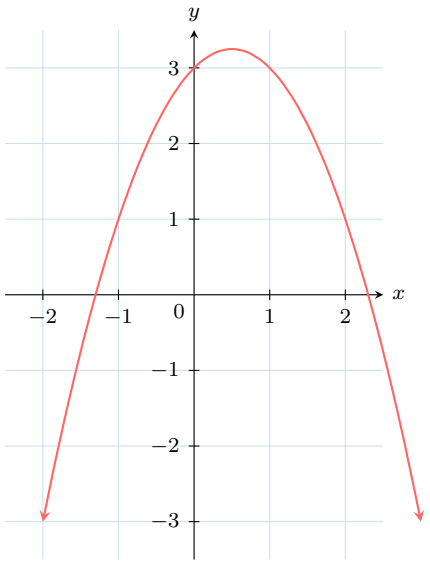


Ex 9: For the function $f(x) = \frac{x^2}{2} - 2x - 1$, sketch the graph of f.(You may fill in a table of values for $x = -2, -1, 0, 1, 2, 3, 4$.)



B.2 DETERMINING THE SIGN OF a FROM THE GRAPH

MCQ 10: For the quadratic function $f(x) = ax^2 + bx + c$ with this following graph

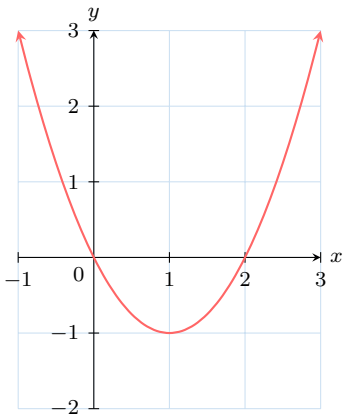


State the sign of a

☐ $a > 0$

☐ $a < 0$

MCQ 11: For the quadratic function $f(x) = ax^2 + bx + c$ with the following graph

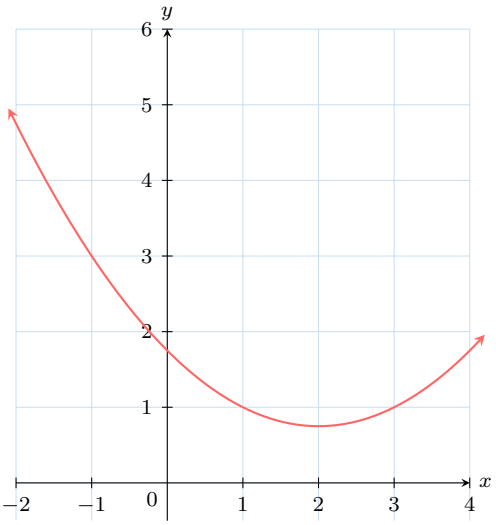


State the sign of a

☐ $a > 0$

☐ $a < 0$

MCQ 12: For the quadratic function $f(x) = ax^2 + bx + c$ with the following graph

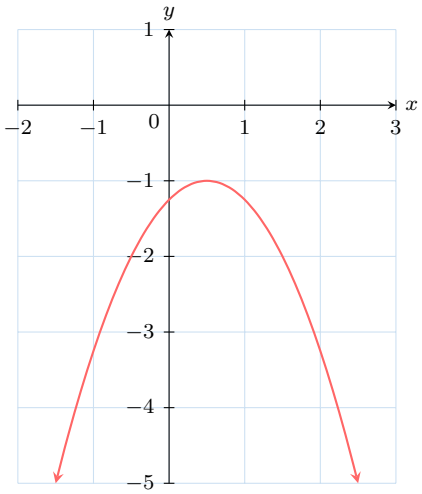


State the sign of a

☐ $a > 0$

☐ $a < 0$

MCQ 13: For the quadratic function $f(x) = ax^2 + bx + c$ with the following graph



State the sign of a

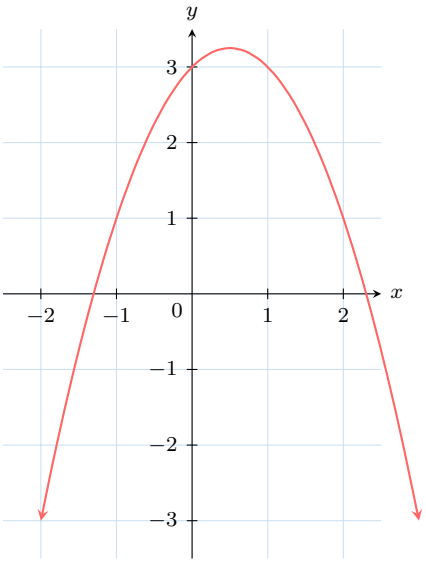
☐ $a > 0$

☐ $a < 0$

C SOLVING $f(x) = y$

C.1 FINDING x SUCH THAT $f(x) = y$ GRAPHICALLY

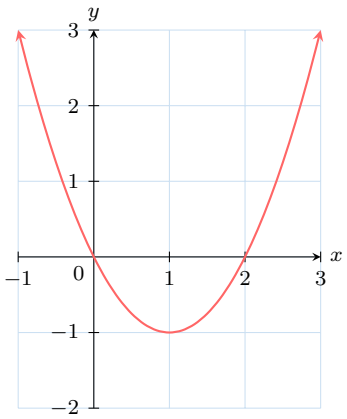
Ex 14: The graph of $y = f(x)$ is:



Find x such that $f(x) = 1$.

$x =$ ☐ or $x =$ ☐

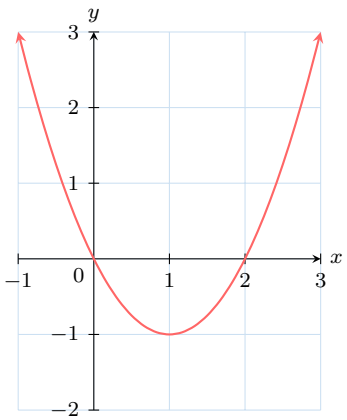
Ex 15: The graph of $y = f(x)$ is:



Find x such that $f(x) = -1$.

$x =$ ☐

Ex 16: The graph of $y = f(x)$ is:



Find x such that $f(x) = 0$. These values of x are the **x-intercepts** of the graph.

$x =$ ☐ or $x =$ ☐

C.2 FINDING x SUCH THAT $f(x) = y$ ANALYTICALLY

Ex 17: For the function $f(x) = x^2 + 2x - 2$, find the value(s) of x for which $f(x) = 1$.

Ex 18: For the function $f(x) = x^2 - 2x + 5$, find the value(s) of x for which $f(x) = 2$.

Ex 19: For the function $f(x) = x^2 + 2x - 2$, find the x-intercept(s) (the value(s) of x for which $f(x) = 0$).

C.3 APPLYING QUADRATIC FUNCTIONS TO REAL-WORLD SITUATIONS

Ex 20: A ball is thrown upward. Its height above the ground is given by the function

$$h(t) = -5t^2 + 20t + 1 \text{ metres,}$$

where t is the time in seconds from when the ball is thrown.

1. How high is the ball above the ground after 2 seconds?

   ☐ m

2. From what height above the ground was the ball released?

   ☐ m

3. At what times is the ball 16 m above the ground? (order from lowest to highest)

   ☐ s, ☐ s

Ex 21: A manufacturer produces x cakes. The profit from producing x cakes is given by the function

$$P(x) = -5x^2 + 30x + 2 \text{ dollars,}$$

where x is the number of cakes produced.

1. What is the profit from producing 3 cakes?

   ☐ dollars

2. What is the fixed profit (or loss) when no cakes are produced?

   ☐ dollars

3. For what numbers of cakes is the profit 27 dollars? (order from lowest to highest)

   ☐, ☐

Ex 22: A stone is thrown into the air. Its height above the ground is given by the function

$$h(t) = -5t^2 + 30t + 2 \text{ metres,}$$

where t is the time in seconds from when the stone is thrown.

1. How high is the stone above the ground after 3 seconds?

   ☐ m

2. From what height above the ground was the stone released?

   ☐ m

3. At what times is the stone 27 m above the ground? (order from lowest to highest)

   ☐ s, ☐ s