1 *Look at the two graphs on the board. Identify which is a graph of the cube function ($f(x) = x^3$) and which is a graph of the cube-root function ($f(x) = \sqrt[3]{x}$).*

a This is the graph of the cube-root function.

b This is the graph of the cube function.

2 *Let f be the function given by*

$$f(x) = \begin{cases} 2x - 4 & \text{for } -1 \le x \le 2, \\ x^3 - 2 & \text{for } 2 < x \le 3. \end{cases}$$

a What is $f(1)$? (Either show what numerical calculation you make, or show how you get the answer from a graph.)

If $x = 1$, then $-1 \le x \le 2$ is true, so $f(x) = 2x - 4$. Therefore,

$$f(1) = 2(1) - 4 = -2.$$

b What is $f(3)$? (Either show what numerical calculation you make, or show how you get the answer from a graph.)

If $x = 3$, then $-1 \le x \le 2$ is false, but $2 < x \le 3$ is (barely) true, so $f(x) = x^3 - 2$. Therefore,

$$f(3) = (3)^3 - 2 = 25.$$

c **Extra credit:** *What is $f(-2)$? Explain why.*

If $x = -2$, then $-1 \le x \le 2$ is false, and $2 < x \le 3$ is still false. Therefore, $f(-2)$ is **undefined**.

3 *Given*

$$f(x) = x^2,$$
$$g(x) = x^2 + 4,$$

find a simplified formula for $f \circ g$. (Show at least one intermediate step.)

If it helps, write the formula for f as

$$f(y) = y^2.$$

Then taking y to be $g(x)$, we have

$$(f \circ g)(x) = f\Big(g(x)\Big) = f(x^2 + 4) = (x^2 + 4)^2.$$

You could also leave this in expanded form as $x^4 + 8x^2 + 16$.