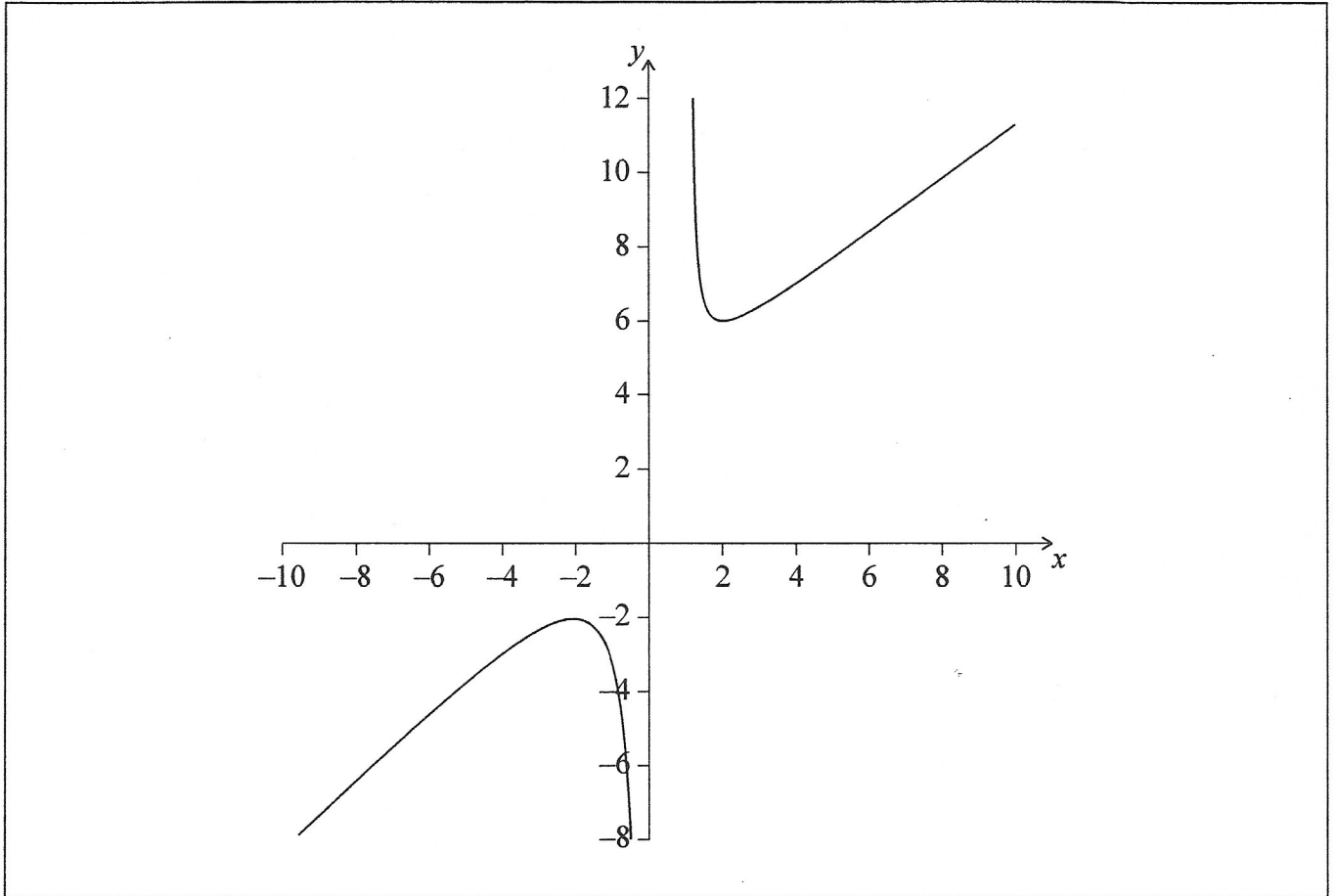


12. The function f is of the form $f(x) = ax + b + \frac{c}{x}$, where a , b and c are positive integers.

Part of the graph of $y = f(x)$ is shown on the axes below. The graph of the function has its local maximum at $(-2, -2)$ and its local minimum at $(2, 6)$.

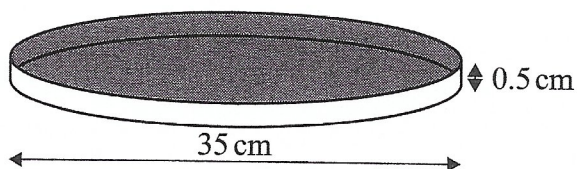


- (a) Write down the domain of the function. [2]
- (b) (i) Draw the line $y = -6$ on the axes.
- (ii) Write down the number of solutions to $f(x) = -6$. [2]
- (c) Find the range of values of k for which $f(x) = k$ has no solution. [2]

(This question continues on the following page)

4. [Maximum mark: 15]

A pan, in which to cook a pizza, is in the shape of a cylinder. The pan has a diameter of 35 cm and a height of 0.5 cm.



- (a) Calculate the volume of this pan. [3]

A chef had enough pizza dough to exactly fill the pan. The dough was in the shape of a sphere.

- (b) Find the radius of the sphere in cm, correct to one decimal place. [4]

The pizza was cooked in a hot oven. Once taken out of the oven, the pizza was placed in a dining room.

The temperature, P , of the pizza, in degrees Celsius, $^{\circ}\text{C}$, can be modelled by

$$P(t) = a(2.06)^{-t} + 19, t \geq 0$$

where a is a constant and t is the time, in minutes, since the pizza was taken out of the oven.

When the pizza was taken out of the oven its temperature was 230°C .

- (c) Find the value of a . [2]
- (d) Find the temperature that the pizza will be 5 minutes after it is taken out of the oven. [2]

The pizza can be eaten once its temperature drops to 45°C .

- (e) Calculate, to the nearest second, the time since the pizza was taken out of the oven until it can be eaten. [3]
- (f) In the context of this model, state what the value of 19 represents. [1]

3. [Maximum mark: 14]

Consider the function $f(x) = 0.3x^3 + \frac{10}{x} + 2^{-x}$.

- (a) Calculate $f(1)$. [2]
- (b) Sketch the graph of $y = f(x)$ for $-7 \leq x \leq 4$ and $-30 \leq y \leq 30$. [4]
- (c) Write down the equation of the vertical asymptote. [2]
- (d) Write down the coordinates of the x -intercept. [2]
- (e) Write down the possible values of x for which $x < 0$ and $f'(x) > 0$. [2]

Consider a second function, $g(x) = 2x - 3$.

- (f) Find the solution of $f(x) = g(x)$. [2]