**6.**

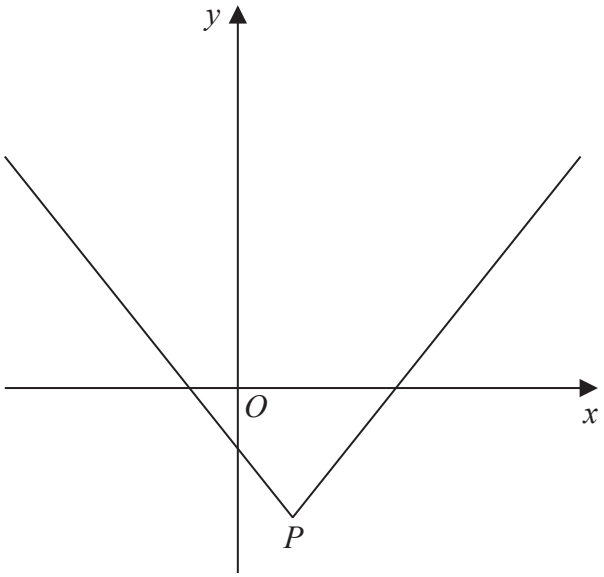



**Figure 2**

Figure 2 shows a sketch of the graph $y = f(x)$, where

$$f(x) = 3|x - 2| - 10$$

The vertex of the graph is at point $P$, shown in Figure 2.

(a) Find the coordinates of $P$

**(2)**

(b) Find $ff(0)$

**(2)**

(c) Solve the inequality

$$3|x - 2| - 10 < 5x + 10$$

**(2)**

(d) Solve the equation

$$f(|x|) = 0$$

**(3)**

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**Question 6 continued**

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**Question 6 continued**

**(Total for Question 6 is 9 marks)**

**7.** A scientist is studying two different populations of bacteria.

The number of bacteria $N$ in the first population is modelled by the equation

$$N = Ae^{kt} \qquad t \geqslant 0$$

where $A$ and $k$ are positive constants and $t$ is the time in hours from the start of the study.

Given that

- there were 2500 bacteria in this population at the start of the study
- there were 10 000 bacteria 8 hours later

(a) find the exact value of $A$ and the value of $k$ to 4 significant figures.

**(3)**

The number of bacteria $N$ in the second population is modelled by the equation

$$N = 60\,000e^{-0.6t} \qquad t \geqslant 0$$

where $t$ is the time in hours from the start of the study.

(b) Find the rate of decrease of bacteria in this population exactly 5 hours from the start of the study. Give your answer to 3 significant figures.

**(2)**

When $t = T$, the number of bacteria in the two different populations was the same.

(c) Find the value of $T$, giving your answer to 3 significant figures.

(*Solutions relying entirely on calculator technology are not acceptable*.)

**(3)**

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