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VCE Specialist Mathematics ½
AOS 1 Revision [1.0]
SAC 1

40 Marks. 5 Minutes Reading. 40 Minutes Writing.

Section A: SAC Questions (40 Marks)**Question 1** (6 marks)

- a. If $|x| = 5$, find the possible values of $|2x + 3|$. (1 mark)

- b. Solve the equation $2|x| - 3 = 2$. (1 mark)

- c. Solve the inequality $|2x + 1| < 5$. (1 mark)

- d. Solve the equation $|x^2 - 4x + 1| = 4$. (3 marks)

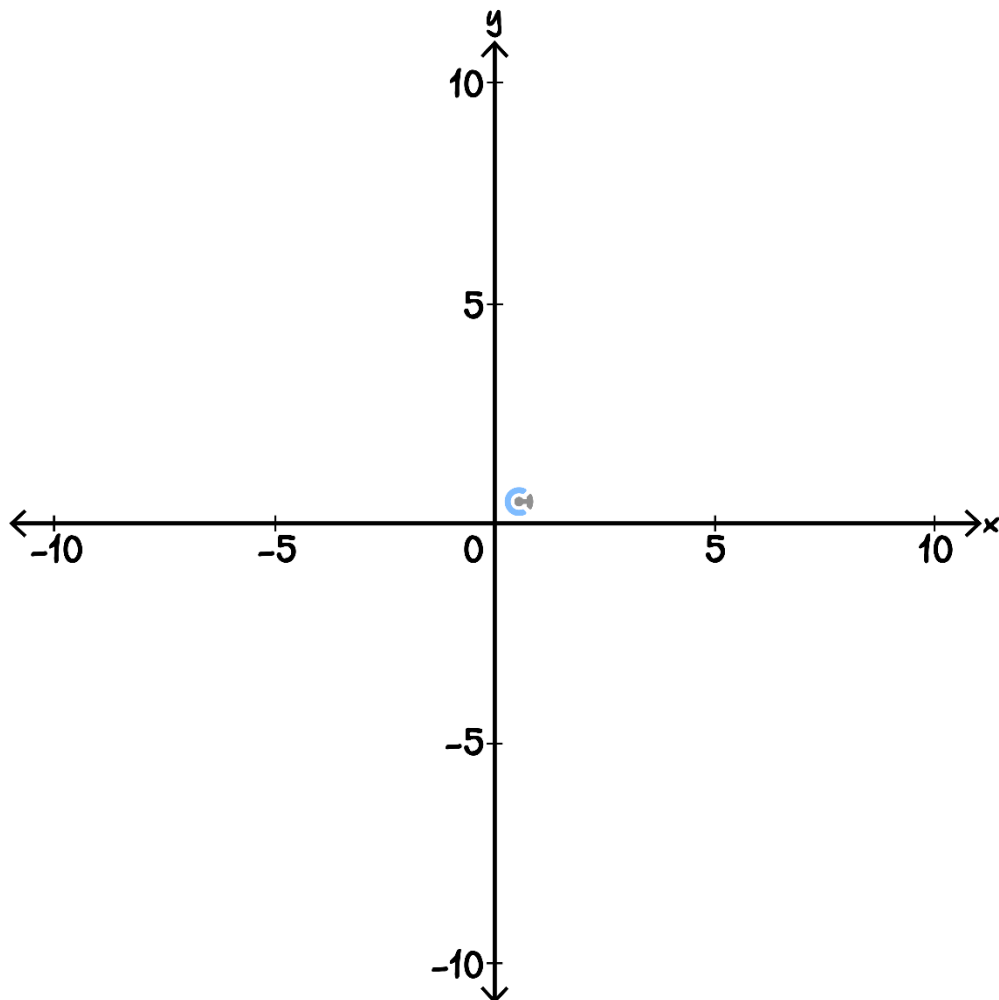
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Question 2 (4 marks)

You are given that:

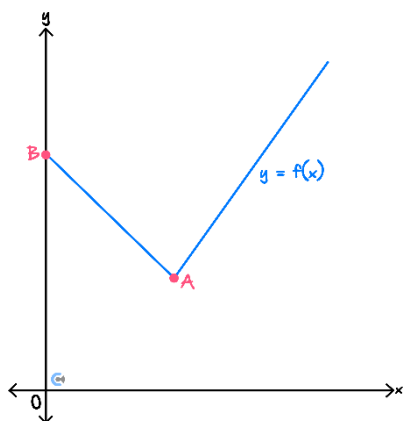
$$f(x) = |2x - 1| - 2$$

- a. Sketch the graph of $f(x)$ on the set of axes below, clearly indicating the coordinates of any points where the graph of $f(x)$ meets the coordinate axes. (2 marks)



- b. Using your graph, or otherwise, find the values of x for which $f(x) \geq 3$. (2 marks)

Question 3 (6 marks)



The above figure shows a sketch of part of the graph of $y = f(x)$, where:

$$f(x) = a|h - x| + b$$

- a.** You are given that the coordinates of A are $(3,5)$ and the coordinates of B are $(0,11)$. Find the values of a , h and b . (2 marks)

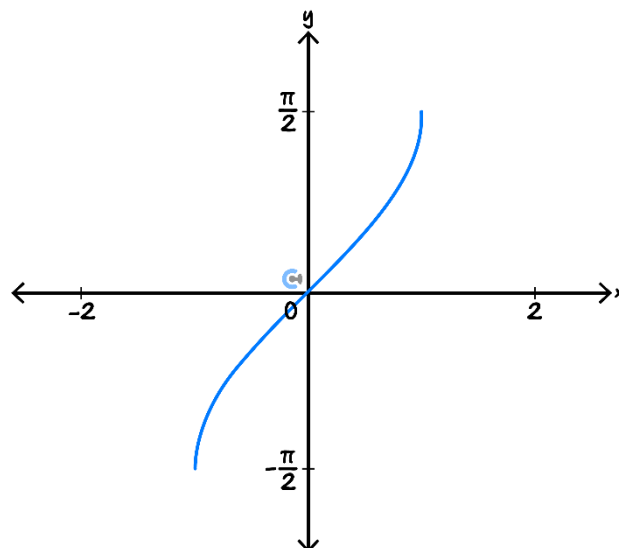
- b.** Solve the equation $f(x) = \frac{1}{2}x + 30$ for x . (3 marks)

Given that the equation $f(x) = k$, where k is a constant, has two distinct roots.

c. State the set of possible values for k . (1 mark)

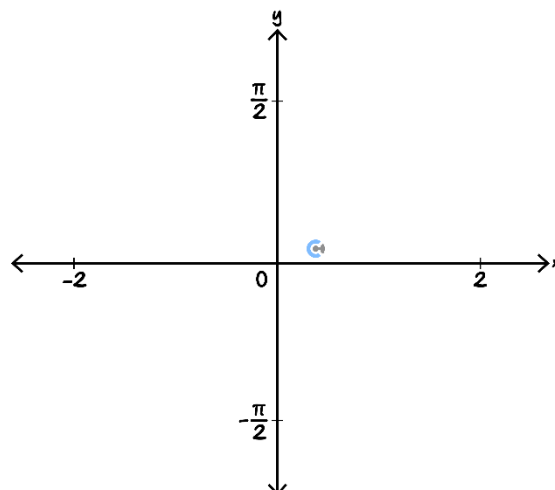
Question 4 (4 marks)

The graph of $y = f(x)$ is shown on the set of axes below:

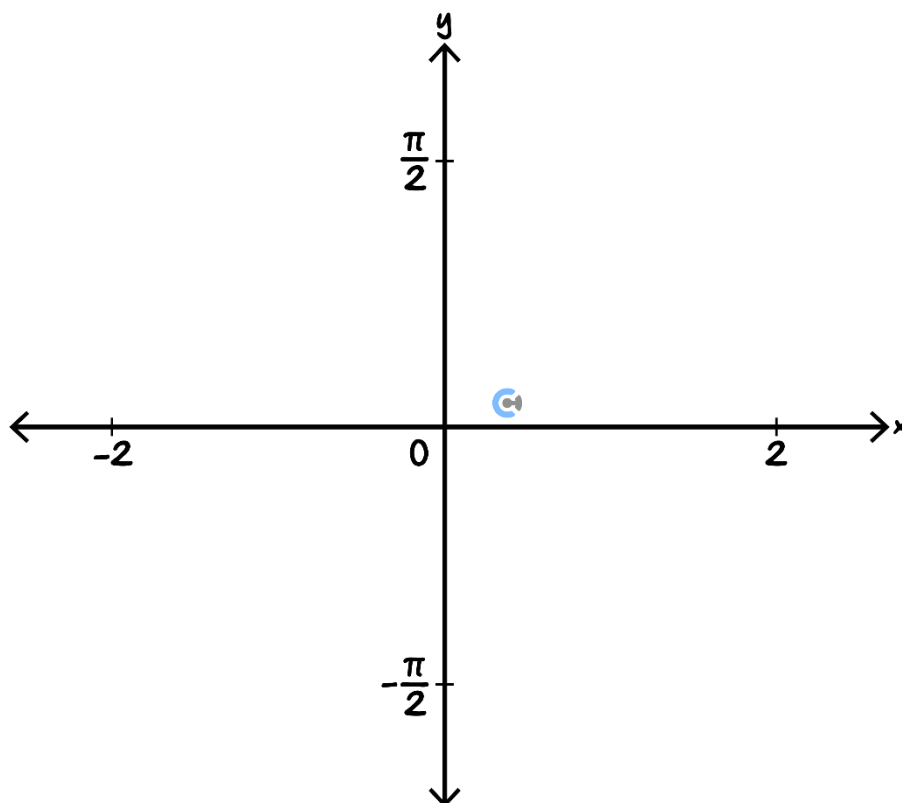


On the set of axes below, sketch the graphs of:

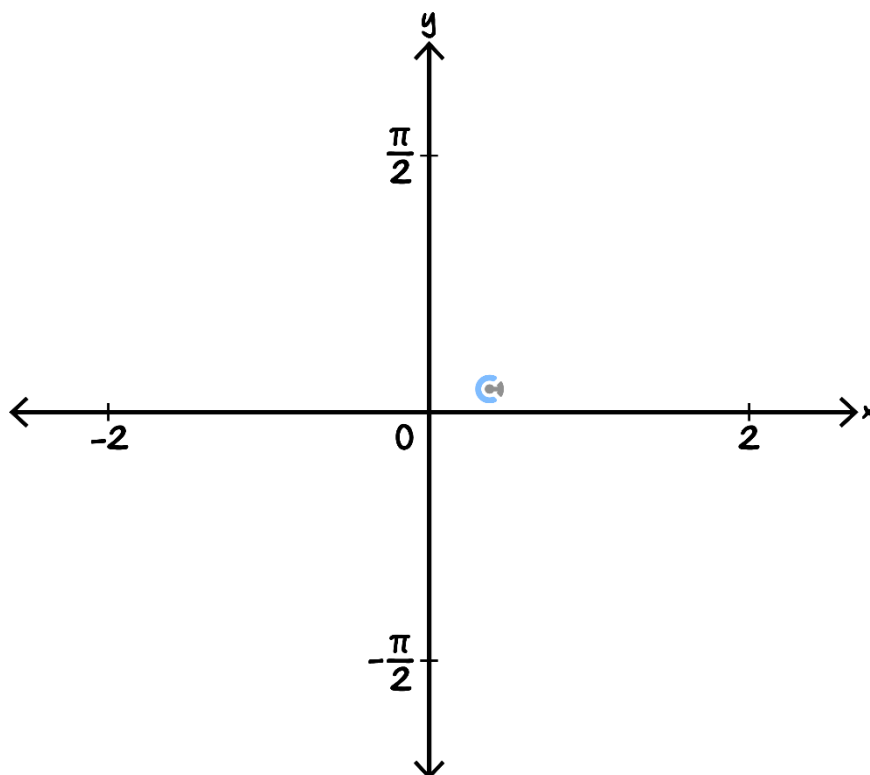
a. $y = |f(x)|$. (1 mark)



b. $y = f(|x|)$. (1 mark)



c. $y = f(-|x|) + \frac{\pi}{2}$. (2 marks)



Question 5 (3 marks)

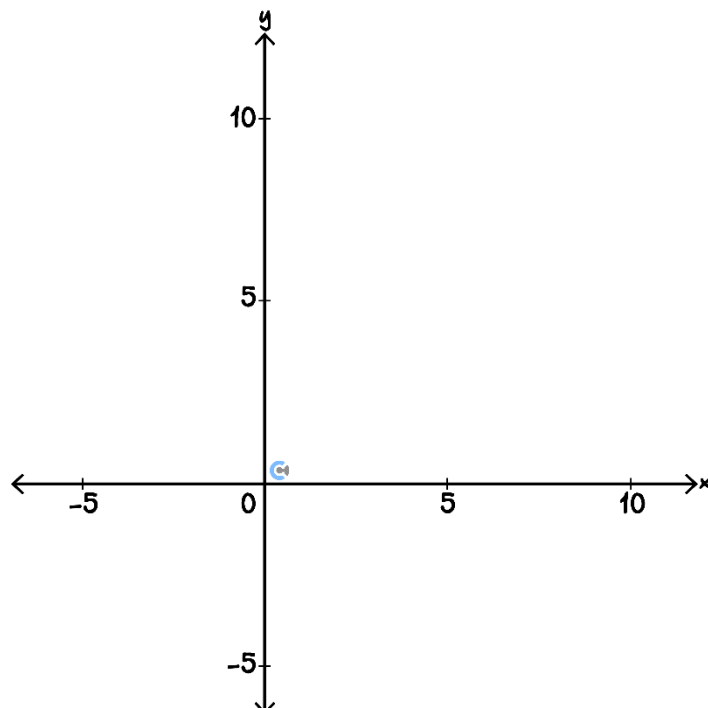
Solve the following inequality for x :

$$|2x - 1| - 1 < |x - 1|$$

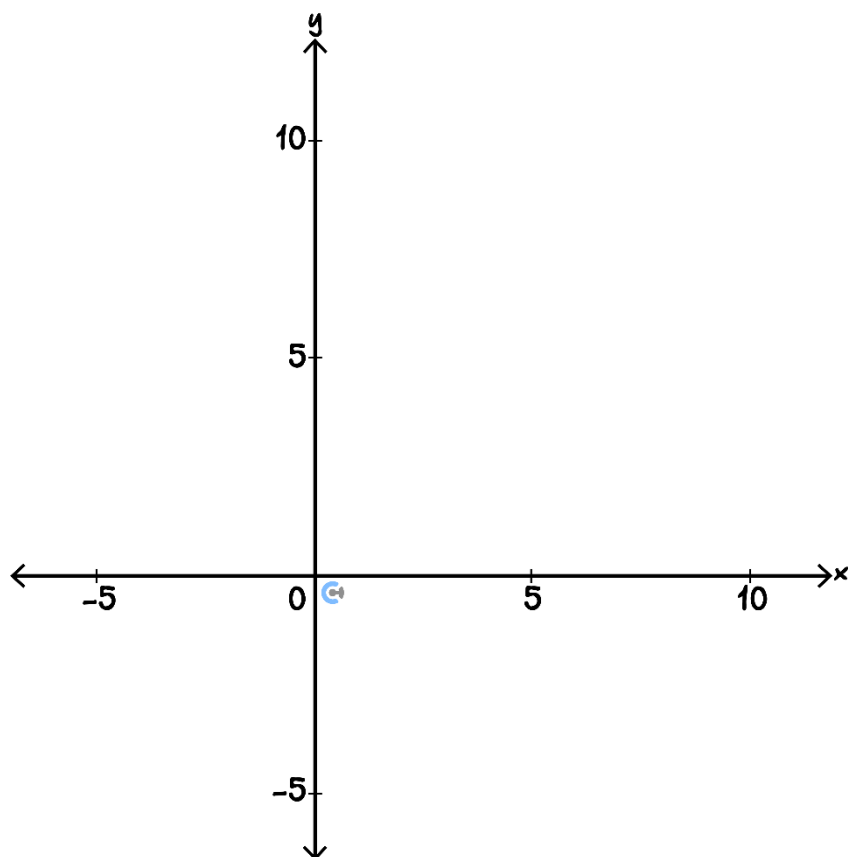
Question 6 (8 marks)

Consider the function $f : R \setminus \{2\} \rightarrow R, f(x) = \frac{1}{x-2} - 1$.

- a. Sketch the graph of $y = f(x)$ on the set of axes below, labelling all asymptotes and axial intercepts. (2 marks)



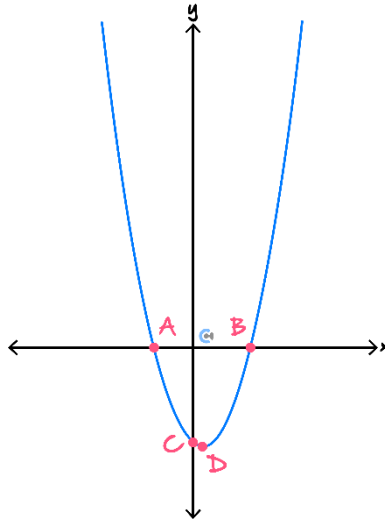
- b. Hence, on the set of axes below, sketch the graph of $y = |f(x)|$, labelling all asymptotes and axial intercepts. (2 marks)



- c. On the same set of axes above in **part b.**, sketch the line $y = x + 2$, labelling the axial intercepts. (1 mark)
- d. Hence, solve the inequality $|f(x)| \leq x + 2$. (3 marks)

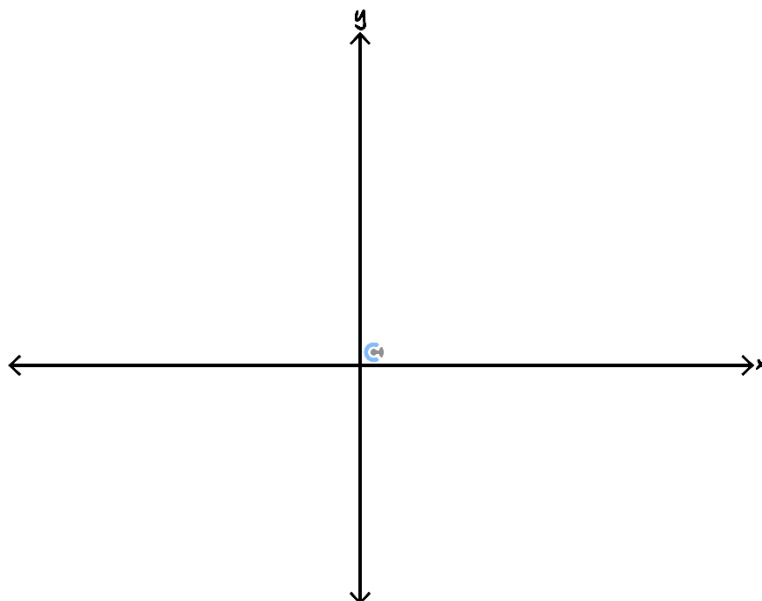
Question 7 (9 marks)

The graph of $y = g(x)$, where $g(x) = x^2 - x - 6$ is shown below:



- a. Write down the coordinates of A, B, C and D . (2 marks)

- b. On the set of axes below, sketch the graph of $y = g(|x|)$, labelling all turning points and axial intercepts. (3 marks)



c. Find all the values of k for which the equation $g(|x|) + k = 0$ has:

i. Three distinct solutions. (1 mark)

ii. Four distinct solutions. (1 mark)

iii. Two distinct solutions. (2 marks)

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