Topic : 2.12 to 2.16
Total Marks : 68 Total Time : 70 mins
Prior to starting the test, please take a moment to carefully review the following instructions:

1. On the first page please mention your name, start time, and end time of the test and share your answer sheet as a single pdf.
2. To create a realistic test environment, ensure that you are live on Zoom during the test, for that you must use the Zoom app not web version. Keep your video camera turned on and share your entire desktop.
3. **IMPORTANT:** If you encounter any questions that haven't been covered in class yet or fall outside the test syllabus, no need to worry. Just skip that question and mention 'NA', and your grades will be based on the questions you attempted.
4. Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
5. You are allowed to use the official IB formula booklet for all tests
6. Use of GDC is allowed.

1. [2 marks]

Find the remainder when $2x^{17} + 5x^{10} - 7x^3 + 6$ is divided by $x - 2$.

2. [5 marks]

Find all the zeros of the polynomial $z^4 + 2z^3 + 6z^2 + 8z + 8$ given that one of the zeros is purely imaginary.

3. (a – 5 marks, b – 3 marks) [8 marks]

$P(x) = 2x^4 - 8x^3 + ax^2 + bx - 110$, $a, b \in \mathbb{R}$, has zeros $m \pm 2i$ and $1 \pm n\sqrt{3}$ where $m, n \in \mathbb{R}$.

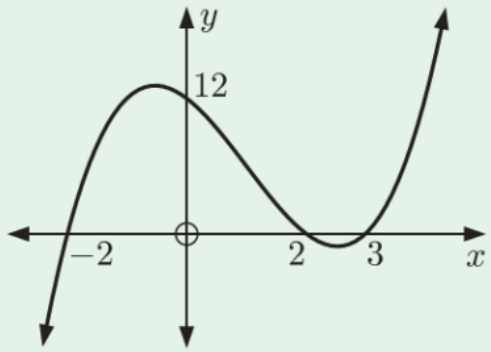
a Find m and n.

b Sketch the graph of $y = P(x)$.

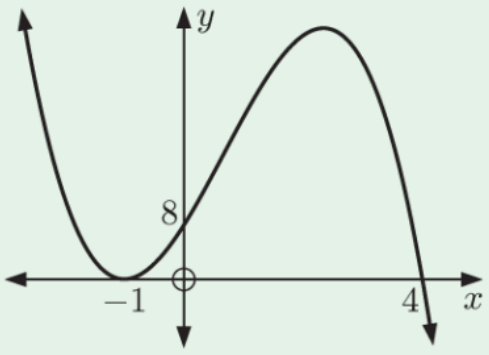
4. (3 marks each) [6 marks]

Find the equation of the cubic with graph:

a



b



5. (6 marks each) [12 marks]

Solve for x exactly:

a $x^3 + x^2 - 12x - 18 < 0$

b $5x^3 - 20 \geqslant 25x - 4x^2$

6. (a -4 marks, b – 4 marks, c – 1mark) [9 marks]

For what values of k is $f(x) = \sin(x - k)$:

a even **b** odd **c** neither?

7. [2 marks]

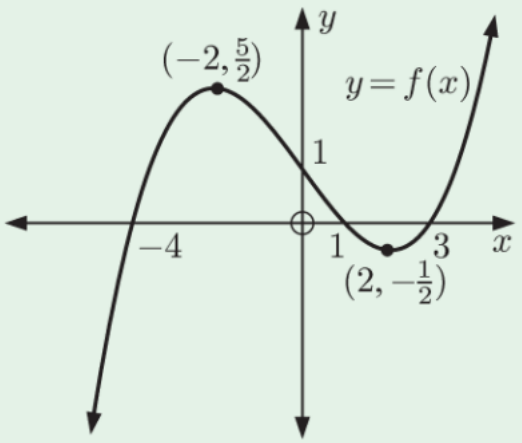
Given that $f(x)$ is an odd function, determine whether $(f \circ f)(x)$ is even, odd, or neither.

8. (3 marks each) [6 marks]

The graph of $y = f(x)$ is given. On the same set of axes, graph the functions:

a $y = f(x)$ and $y = f(|x|)$

b $y = f(x)$ and $y = [f(x)]^2$.



9. (a – 2 marks, b – 3 marks, c – 4 marks) [9 marks]

Solve for x:

a $|x + 3| \leqslant 6$ **b** $|3 - 2x| > 1$ **c** $|3x + 2| < |x - 5|$

10. (a – 3 marks, b – 2 marks, c – 4 marks) [9 marks]

The graph of $f(x) = \dfrac{x + 1}{x^2 - x - 6}$ is shown alongside.

a Find the asymptotes of the function.

b Find the axes intercepts.

c Sketch the graph of $y = |f(x)|$.