# WILLETTON SENIOR HIGH SCHOOL

## MATHEMATICS METHODS – UNIT TWO

## TEST FOUR 2022

**SECTION ONE: Calculator Free**

**STUDENT NAME:** ……

**TOTAL MARKS:** …… / 50

**TIME ALLOWED:** 35 mins

**CIRCLE YOUR TEACHER'S NAME:**

| | | | |
|---|---|---|---|
| Mrs Gatland | Mrs Kalotay | Ms Leow | Ms Mack |
| Mr Riemer | Ms Smirke | Ms Thompson | |

- Formulae sheet supplied.
- No calculators allowed.
- If a question is worth more than 2 marks, sufficient working must be shown to justify your answer, in order to receive full marks.

**QUESTION 1** [2, 2 = 4 marks]

State the next three terms for each of the sequences below:

a. $T_n = -2T_{n-1}$ , $T_1 = -2$

b. $T_{n+1} = T_n + 2n$ , $T_1 = -5$

**QUESTION 2** [1, 2, 3 =6 marks]

Determine the gradient function for each of the following.

a. $y = 2x^5 - 4$

b. $y = \frac{5x^3+4x^2}{x}$

c. $y = (x + 3)^3$

**QUESTION 3** [2 marks]

Write the recursive formula for the following sequence: $\frac{1}{2}$ , $\frac{5}{4}$ , $\frac{4}{2}$ , $\frac{11}{4}$ , ...

**QUESTION 4** [4 marks]

The gradient of a curve is given by $\frac{dy}{dx} = a + 3x$ , where $a$ is a constant. Given the curve has a stationary point at $(2, 5)$, determine its equation.

**QUESTION 5** [1, 3 = 4 marks]

The general term of a sequence is given by $T_n = 4n + 8$. Calculate:

a. $T_5$

b. Which term of the sequence is the first to exceed 217?

**QUESTION 6** [3, 1 = 4 marks]

A research department finds that the revenue produced by pricing an item at $\$p$ is related by the equation $R = -3p^2 + 45p$.

a. Determine the instantaneous rate of change of the revenue when the price of one item is:
   $p = 4$ $p = 8$

b. Should the research team recommend increasing or decreasing the price from \$8?

**QUESTION 7** [4, 2 = 6 marks]

For a geometric sequence; $T_1 = x - 2, \quad T_2 = x + 1, \quad T_3 = x + 5$
Determine:

a. The first three terms.

b. The general rule of the sequence.

**QUESTION 8** [3, 3, 1, 4 = 11 marks]

For the function $f(x) = 5 - 2x^2$,

a. Find an expression for $f(2 + h)$.

b. Show that the average rate of change of $f(x) = 5 - 2x^2$ from $x = 2$ to $x = 2 + h$ is $-2h - 8$ .

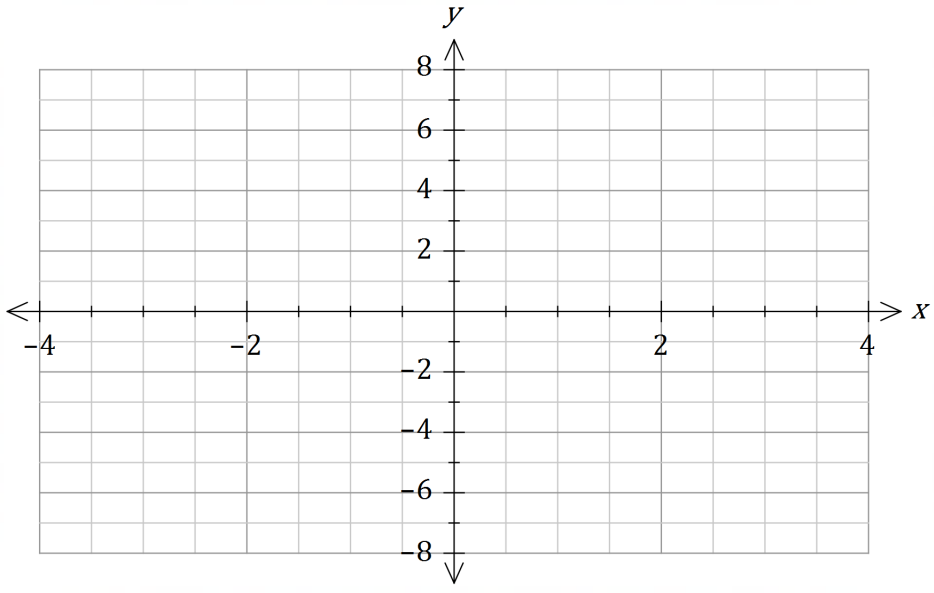
c. Hence, determine the gradient of the tangent to the curve $f(x) = 5 - 2x^2$ at $x = 2$.

d. Determine the equation of the tangent to the curve $f(x) = 5 - 2x^2$ at $x = 2$.

**QUESTION 9** [6, 3 = 9 marks]

a. Using calculus techniques, determine the stationary points and their nature, for the function $y = (x-1)^2(x+2)$.

b. Sketch the graph of the function $y = (x-1)^2(x+2)$ showing clearly the $x$ and $y$ intercepts, stationary points and indicate the behaviour of the graph as $x \to +\infty$ and $x \to -\infty$




**END OF SECTION**

# WILLETTON SENIOR HIGH SCHOOL

## MATHEMATICS METHODS – UNIT TWO

## TEST FOUR 2022

### SECTION TWO: Calculator Assumed

**STUDENT NAME:** ……

**TOTAL MARKS:** ……. / 14

**TIME ALLOWED:** 15 mins

**CIRCLE YOUR TEACHER'S NAME:**

| | | | |
|---|---|---|---|
| Mrs Gatland | Mrs Kalotay | Ms Leow | Ms Mack |
| Mr Riemer | Ms Smirke | Ms Thompson | |

- Formulae sheet supplied.
- Calculators/Classpads allowed.
- 1A4 page of notes ONE SIDE only
- If a question is worth more than 2 marks, sufficient working must be shown to justify your answer, in order to receive full marks.

**QUESTION 10** [4, 1 = 5 marks]

To manufacture $x$ items costs a company $\$(40x + 15000)$. If the company has set a sale price of $\$(150 - 0.02x)$ per item, calculate:

a. The number of items that should be produced to provide a maximum profit.

b. The price per item to achieve this profit.

**QUESTION 11** [4 marks]

The sum to infinity of a geometric sequence is equal to 25, while the first two terms of this sequence add up to 9. Find the value(s) of $T_1$ and $r$ which satisfy these conditions.

**QUESTION 12** [5 marks]

An open, $500m^3$ rectangular storage tank, with a square base, is to be constructed. Using calculus methods, calculate the area of sheet metal required for the construction, if the area of metal used is to be minimized.

**END OF PAPER**