# WILLETTON SENIOR HIGH SCHOOL

## YEAR 12 MATHEMATICS METHODS

## TEST 1 2022

## Section 1: Calculator Free

**Student Name:** _____

**Circle your teacher's name**

**Miss Ahern** **Ms Arora** **Mrs Gatland**

**Mrs Sun** **Mrs Tay**

**Mark:** _____ **/ 24**

**Time:** **25 mins**

**For this test:**

**Scientific calculators and Classpads are NOT allowed**

**Show any working in the spaces provided**

**Question 1** (2, 3 = 5 marks)

Find the derivative of the following functions, fully simplifying where possible

a) $f(x) = \sqrt{x}(2x^3 + 1)$

b) $y = \frac{6x}{(x^2-5x+6)^3}$

**Question 2** (3 marks)

Given that $u = g(x) = 4x - 3$ and $f(u) = \frac{1}{u^2+7}$, determine $(fog)'(x)$. Simplify your answer where possible.

**Question 3** (1, 2 = 3 marks)

Determine the following;

a) The antiderivative of $\frac{3}{\sqrt{x}} - 4x^3 + \frac{2}{5x^3}$

b) $\int 10(6x+1)(6x^2+2x+1)^3 dx$

**Question 4** (7 marks)

The position of a particle is described by the function $x(t) = -\frac{t^3}{3} + t^2 + 8t + 1$ for $t \geq 0$, where $t$ is in seconds and $x(t)$ in cm. Determine the distance travelled by the particle when the acceleration reaches -8 m/s$^2$.

**Question 5** (6 marks)

A small moving body, W moves in a straight line with acceleration $a$ m/s$^2$ at time $t$ s given by the function $a = At + B$.

Initially, W had a displacement of 12 m from a fixed point of O and moves with a velocity of 3 m/s. Two seconds later, W has a displacement of 1.8 cm and a velocity of -2 cm/s.

Determine the value of the constants $A$ and $B$.

**END OF SECTION**

# WILLETTON SENIOR HIGH SCHOOL

## YEAR 12 MATHEMATICS METHODS

## TEST 1 2022

## Section 2: Calculator Allowed

**Student Name:** _____

**Circle your teacher's name**

**Miss Ahern** **Ms Arora** **Mrs Gatland**

**Mrs Sun** **Mrs Tay**

**Mark:** _____ **/ 26**

**Time:** **25 mins**

**For this test:**

**Scientific calculators and Classpads are allowed**

**One A4 single side of notes is allowed**

**Show any working in the spaces provided**

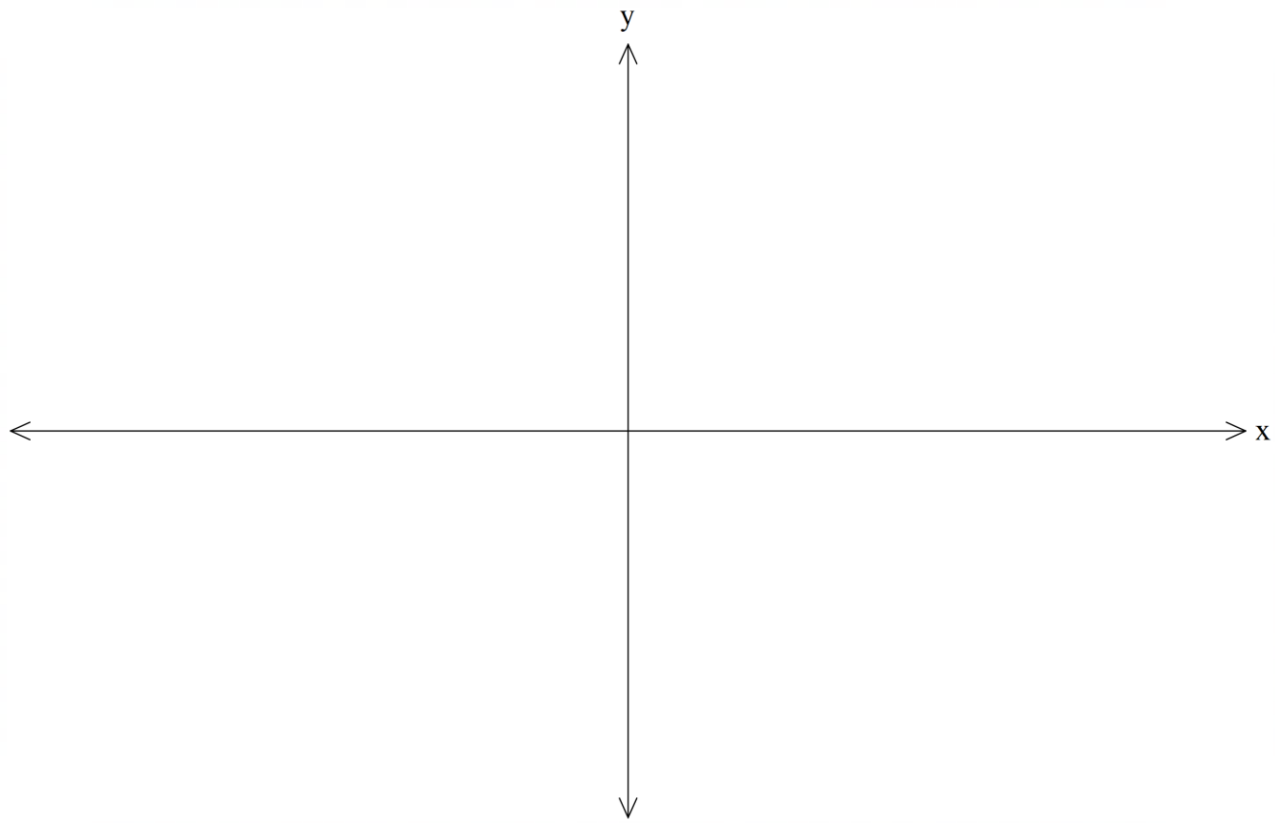
**Question 6** (7, 3, 4 = 14 marks)

Consider the function $f(x) = -x^4 + 2x^3 + 11x^2 - 12x$

a) Use calculus to determine all stationary points of $f(x)$ and determine their nature.

b) Determine the coordinates of any points of inflection.

c) Hence, sketch the graph of $f(x)$, clearly indicating the location of all intercepts, stationary points and points of inflection.

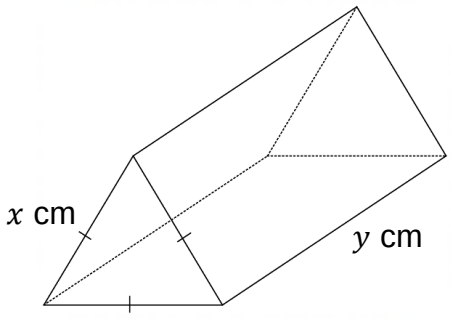



**Question 7** (5 marks)

A spherical balloon has a volume $V = \frac{4\pi r^3}{3}$, where $r$ is the radius of the balloon. Using the incremental change formula, find the approximate percentage increase of the balloon's volume when its diameter increases by 3%.

**Question 8** (7 marks)

A plastic block is made in the shape of a right triangular prism. The triangular end is an equilateral triangle with side length $x$ cm and the length of the block is $y$ cm. The volume of the block is 600 cm$^3$. Determine the dimensions of the block to minimise the total surface area of the block.




**END OF ASSESSMENT**