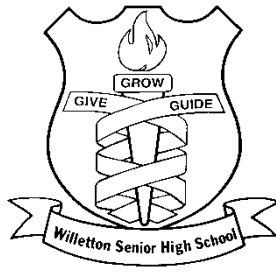


WILLETTON SENIOR HIGH SCHOOL



YEAR 12 MATHEMATICS METHODS

TEST 1 2023

Section 1: Calculator Free

Student Name: _____

Circle your teacher's name.

Miss Ahern

Mr Galbraith

Mrs Gatland

Mrs Sun

Mark: _____ / 26

Time: 25 mins

For section 1 of this test:

No notes.

No calculators.

Formula sheet as provided.

Show working.

QUESTION ONE (2, 3, 3 = 8 MARKS)

a) Find the second derivative of $y = \frac{1}{2x}$, simplifying your answer

,[2]

b) Differentiate $m = 2n^4(3n - 2)^3$ with respect to n , writing your answer in factorised form.

[3]

c) If $f(x) = \frac{2x}{x-1}$ and $g(x) = \sqrt{x}$ determine $(f \circ g)'(x)$, simplifying your answer.

[3]

QUESTION TWO (2, 2 = 4 MARKS)

a) Find the antiderivative of $(3x + 7)^{\frac{4}{3}}$

[2]

b) Determine $\int \frac{8x-16}{\sqrt{x^2-4x+7}} dx$

[2]

QUESTION THREE (3 MARKS)

Determine $f(x)$ if $f'(x) = \frac{2}{(4-2x)^2}$ and $f(1) = 2$

QUESTION FOUR (3, 2 = 5 MARKS)

An athlete who has been running at a steady speed of 5 m/s, decides to accelerate for a period of 6 seconds. During this 6 second period the acceleration increases at a constant rate from 0 m/s² to 3 m/s²

a) At what speed is the athlete running at the end of the acceleration period?

[3]

b) How far does the athlete travel during the acceleration period?

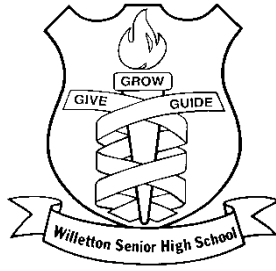
[2]

QUESTION FIVE (6 MARKS)

For the graph of $y = f(x) = 7 + 4x - x^3 - \frac{1}{4}x^4$, determine the location of any points of inflection, and justify why they are points of inflection.

END OF SECTION 1

WILLETTON SENIOR HIGH SCHOOL



YEAR 12 MATHEMATICS METHODS

TEST 1 2023

Section 2: Calculator Assumed

Student Name: _____

Circle your teacher's name.

Miss Ahern

Mr Galbraith

Mrs Gatland

Mrs Sun

Mark: _____ / 24

Time: 25 mins

For section 2 of this test:

Calculators allowed.

One A4 single side of notes allowed.

Show working.

Formula sheet as provided.

QUESTION SIX (3, 2 = 5 MARKS)

A particle moves along a straight line. Its displacement, x cm from a fixed-point O on the line at time t seconds, is given by $x = \frac{10t}{t^2+1}$.

a) Determine the velocity of the particle when the acceleration is zero.

[3]

b) At what time(s) is the speed of the particle increasing?

[2]

QUESTION SEVEN (2,2 = 4 MARKS)

The acceleration 'a' in cm/s^2 of a particle P moving in a straight line from a fixed point O at time t seconds is given by $a = 12 - 6t$. The initial velocity of P is equal to -9 cm/s when it is 4 cm to the right of O.

a) At what time(s) does the particle experience maximum velocity?

[2]

b) When is the position of the particle to the left of the fixed point O?

[2]

QUESTION EIGHT (3 MARKS)

The side, x , of a cube is measured with 3% error. Estimate, with the aid of the increments formula, the approximate percentage error in the surface area of the cube.

QUESTION NINE (2,1,3 = 6 MARKS)

A television company has 1000 subscribers who are paying \$5 per month. The company can get 100 more subscribers for each \$0.10 decrease in the monthly fee.

a) If x represents the monthly fee, show that the number of subscribers(N) in terms of x is $-1000x + 6000$. [2]

b) Find the revenue(R) in terms of x . [1]

c) Find the monthly fee that will yield the maximum revenue and state this maximum revenue. [3]

QUESTION TEN (4, 2 = 6 MARKS)

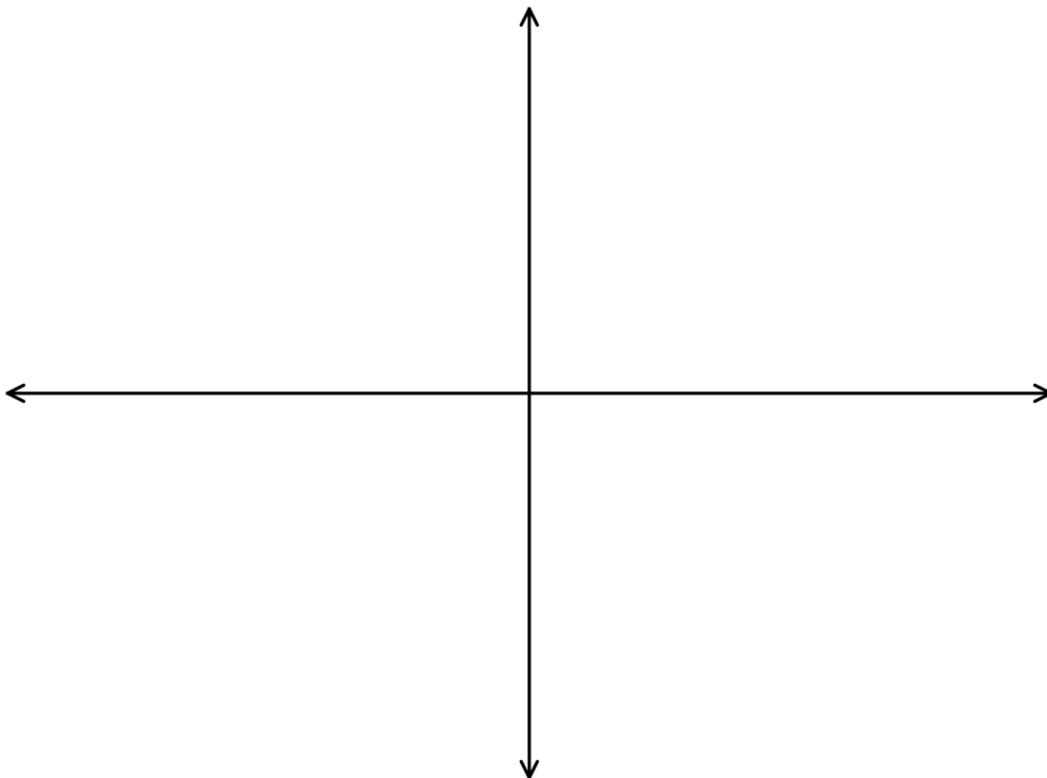
A cubic function f has the rule $f(x) = ax^3 + bx^2 + \frac{150}{7}x$. The graph of this cubic function has a stationary point at $x = 1$ and a point of inflection at $x = 3$.

a) Find the values of a and b exactly.

[4]

b) Sketch the graph of $y = f'(x)$ below.

[2]



END OF SECTION 2