Question 12. **[2, 2 marks]** Ex 2B Q33

$\frac{x+2}{(x+1)(x-2)} = \frac{A}{x+1} + \frac{B}{x-2}$ where A and B are constants.

a) Determine the values of A and B.

$\frac{A(x-2) + B(x+1)}{(x+1)(x-2)} = \frac{x+2}{(x+1)(x-2)}$

$Ax - 2A + Bx + B = x + 2$

$Ax + Bx - 2A + B = x + 2$

$A + B = 1$ ✓ $\quad -2A + B = 2$

$3A = -1$ $\quad A = -\frac{1}{3}$ ✓ $\quad B = \frac{4}{3}$

b) Hence, find $\int \frac{x+2}{(x+1)(x-2)}\,dx$

$= \int -\frac{1}{3(x+1)} + \frac{4}{3(x-2)}\,dx$ ✓

$= -\frac{1}{3}\ln(x+1) + \frac{4}{3}\ln(x-2) + C$ ✓

The End ☺

MATHEMATICS METHODS

MELVILLE SENIOR HIGH SCHOOL

YEAR 12, UNIT 4: Test 4 2021
Weighting 7%

[Curriculum references: Logarithms 4.1.1- 4.1.14]

Section Two: Calculator–assumed

Student Name: Solutions

Teacher's Name: _____

Time allowed for this section

Reading time before commencing work:	one minute
Working time for paper:	fifteen minutes
Total Marks:	eighteen marks

Material required/recommended for this section

To be provided by the supervisor

This Question/Answer booklet

Formula Sheet (retained from Section One)

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction tape/fluid, erasers, ruler, highlighters

Special Items: drawing instruments, templates, notes on one side of an A4 piece of paper and up to three calculators approved for use in the WACE examinations.

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non–personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

It is recommended that you **do not use pencil**, except in diagrams.

Question 10. **[2, 2, 2, 3 = 9 Marks]**

The annual profit, P **hundred thousand dollars**, of a retail store, is modelled by, $P = 2t\ ln(t)$ for $0 < t < 10$, where t is time in years after establishing the store.

a) Find the instantaneous rate of change of profit with respect to time when t = 1.

$P'(t) = 2\ln t + 2$ ✓

$P'(1) = 2$ ✓ accept 2 \|y or 200 000 \|y

b) Find **when** the rate of change of profit, with respect to time, is:

i) \$0 per year. $2\ln t + 2 = 0$ ✓

$t = 0.37$ years ✓

ii) \$400 000 per year. $4 = 2\ln t + 2$

$t = e$ years ✓✓

or 2.7 years

c) Find the largest loss experienced by the store, and when it occurred.

min when $t = 0.37$ years ✓

$\Rightarrow P(0.37) = 2(0.37)\ln(0.37)$

$= -0.735$

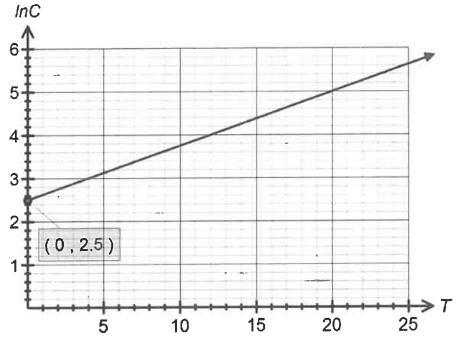
$\Rightarrow$ loss of \$73 500 ✓

must justify with sign test or ✓ graph

Question 11. **[3, 2 = 5 marks]**

Synergy, the provider of electricity in Perth, monitors the maximum consumption of electricity over summer measured against the maximum temperatures.

Graphing the data provides us with the following graph, where C is maximum consumption in megawatts and T is the maximum temperature in degrees Celsius.



(a) Determine the equation of $\ln C$ in terms of T.

using (0, 2.5) and (20, 5)

$m = 0.125$ ✓

$\Rightarrow \ln C = 0.125T + 2.5$ ✓✓

(b) Use your answer to (a) to determine the exponential function which models the energy consumption based on the maximum temperature recorded.

$C = e^{0.125T + 2.5}$ ✓ ✓