KINGSWAY CHRISTIAN COLLEGE

MATHS DEPARTMENT

Course: Mathematics Methods Year 12

Assessment Task: Test 1 – Exponential Functions & Differentiation

Student Name: _____

Date: 16th February 2017

Assessment Score: _____ / 40

Year Score: _____

Comments: _____

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Teacher signature: _____

Parent/ Guardian signature: _____

Comments: _____

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Question 1: [3 Marks]

The population of a certain fish in the Ningaloo Reef grows continuously at a rate of 5% per year. The number of fish on 1st January, 2016 was estimated at 2500.

a) Find an expression to model P, the number of fish, t years into the study.

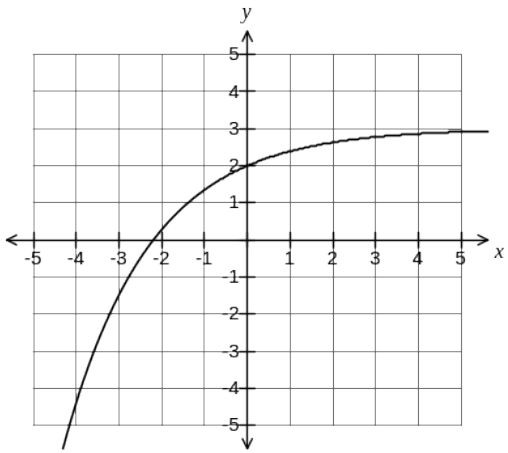
b) Find the population at 1st January, 2020. Give your answer in terms of *e*.

c) Give the calculator algorithm you would use to calculate the time, t, when the population will quadruple in size.

EXTRA WORK SPACE

Question 2: **[2,2 = 4 Marks]**

The graph of $y = a e^{bx} + c$ is shown below. The graph passes through the point $(0, 2)$, and $y \to 3$ as $x \to \infty$.



a) Is b positive or negative? Justify your answer.

b) Evaluate a and c.

Question 3: **[3, 2 = 5 Marks]**

Find $\frac{dy}{dx}$ if:

a) $y=\frac{\sqrt[3]{x^2}-6x^2}{2x}$

b) $y=2ax^a-4a^2$, where a is constant and $a > 0$

Question 4: **[2, 2, 3, 3, 3 = 13 Marks]**

Find the derivative of each of the following. Simplify all answers.

a) $y=(2x-5)(x^2-3x+4)$

b) $y=\frac{3x-2}{3x^2+1}$

Question 7: **[2, 4 = 6 Marks]**

a) Simplify $y=\frac{4x+12}{x^2-9}$, stating any exclusions from the domain.

Hence, make use of the chain rule with Leibnitz notation, to determine:

b) $\frac{dz}{dy}$, if $z=\frac{1}{3x}$ and $y=\frac{4x+12}{x^2-9}$

c) $\left(\sqrt[4]{x^2+4}\right)^3$

d) $y=\dfrac{3x^5}{e^{2x}}$

e) $y=\dfrac{3}{\sqrt{1+e^{5x}}}$

Question 5: **[3,2 = 5 Marks]**

Differentiate the following, without simplifying:

a) $y=\dfrac{x-1}{x^2+4}$

b) $y=e^{2x-x^2}$

Question 6: **[4 Marks]**

Show that $y=\dfrac{1+e^{3x-1}}{2e^{-x^2}}$ can be differentiated **without** using the product **or** quotient rule.