PERTH MODERN SCHOOL

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Independent Public School

Course: Mathematics TEST 4 Year 10

(Indices, Exponential Functions and Sequences)

Student name: _____ Teacher name: _____

Date: _____

Task type: **Response**

Time allowed for this task: **45 mins**

Number of questions: **6**

No calculators or Classpads are allowed for this assessment.

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

Special items: Drawing instruments, templates, and notes on one unfolded sheet of A4 paper

Marks available: **48 marks**

Task weighting: **25%**

Formula sheet provided: Yes

Note: All part questions worth more than 2 marks require working to obtain full marks.

QUESTION 1 (2.1.1. – 2.1.2) **[1, 2, 2, 2, 3 marks – TOTAL: 10 marks]**

Simplify the following index expressions. Your final expressions should have positive indices.

a) $\frac{8^6}{8^2}$

b) $2ab^5 \times 5a^3b^7$

c) $(5x^4y^3)^3$

d) $(121a^2b^6c^5)^{\frac{1}{2}}$

e) $\frac{150xy^4z^2}{15x^2y^3z^6}$

QUESTION 2 (2.1.4, 2.1.7) **[1, 3, 3 marks – TOTAL: 7 marks]**

Solve for the following index statements:

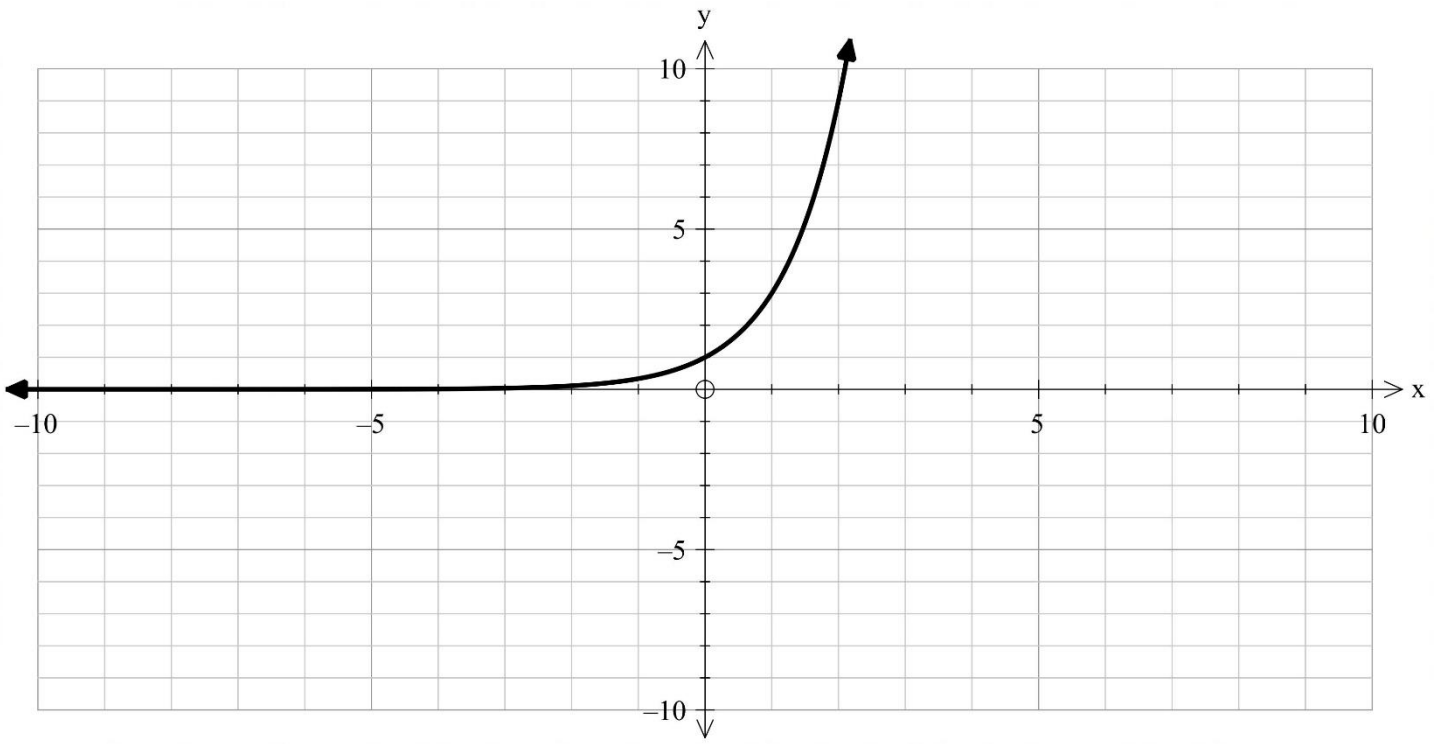
a) $4^x = 64$

b) $3^{x+1} = 81$

c) $49^x = 7^{5x+3}$

QUESTION 3 (2.1.5) **[2, 2, 2, 6 marks – TOTAL: 12 marks]**

Below is the graph of the exponential function $y = 3^x$



a) The graph of $y = 3^x$ is then transformed into the following equations. For each equation, describe the transformation occurring.

i. $y = 3^{x+2}$

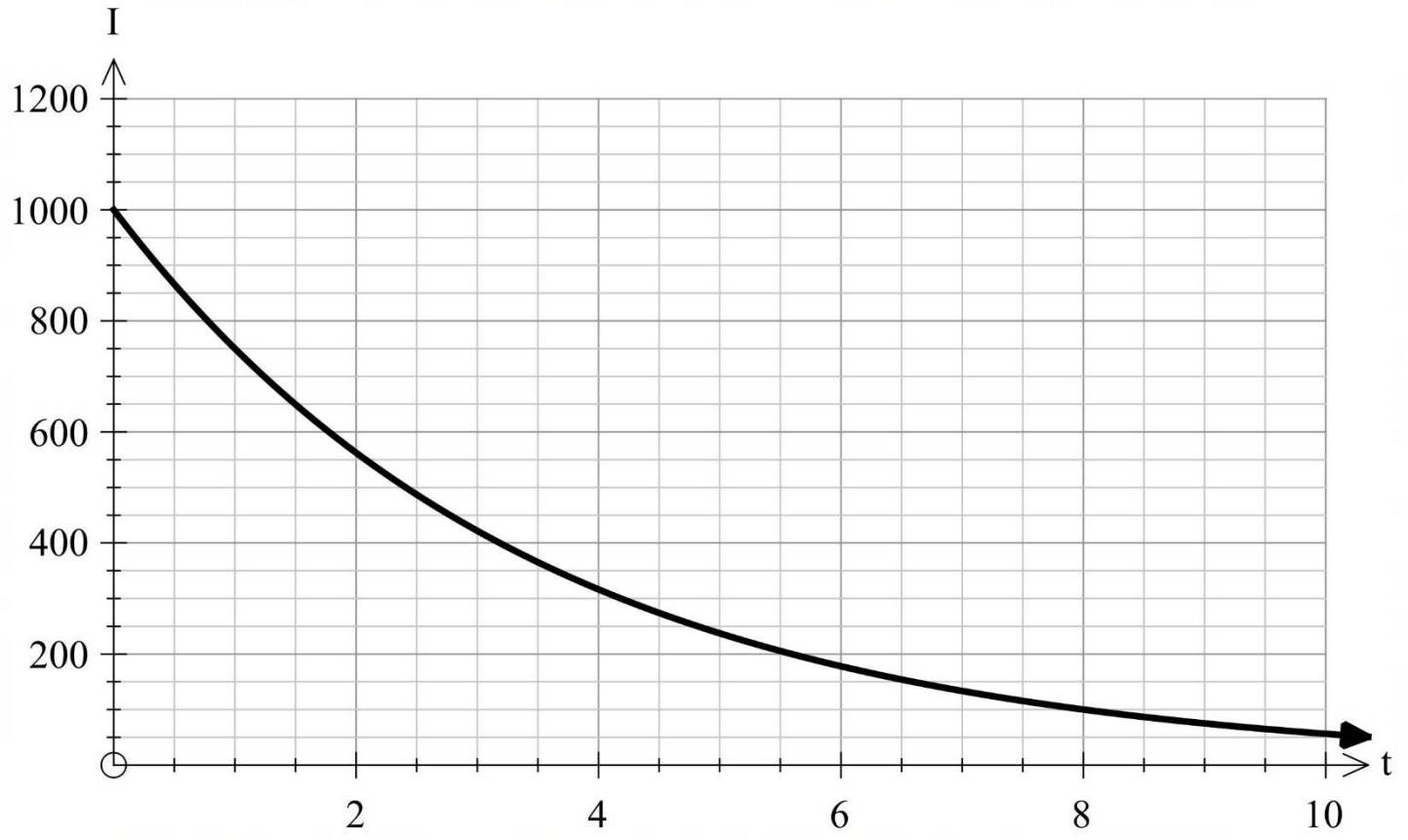
ii. $y = 3^x - 3$

iii. $y = -3^x$

b) For each equation above, graph them on the same axes as $y = 3^x$

QUESTION 4 (2.1.4 – 2.1.7) **[2, 2 marks – TOTAL: 4 marks]**

A radioactive element decays based on the exponential model $I = I_0 \times b^t$ where t is measured in hours and I_0 is the initial amount of the radioactive material measured in grams. The graph of the model is shown below:



a) Determine the initial amount of the material, I_0, and the value of the constant multiplying ratio, b.

b) Show how to use the graph to predict the half-life of the radioactive material. State how long it takes for the radioactive material to decay to half of its amount.

QUESTION 5 (2.2.1 – 2.2.2, 2.2.5 – 2.2.6) **[2, 2, 2, 2 marks – TOTAL: 8 marks]**

Determine the first four terms of the following sequences:

a) $T_{n+1} = 5T_n$ $T_1 = 6$

b) $T_n = 100 + 4(n - 1)$

c) An arithmetic sequence that has a fifth term of 64 and a constant difference of 9

d) A geometric sequence that has a sixth term of 1000 and a constant ratio of 2

QUESTION 6 (2.2.1 – 2.2.2) **[3, 1, 3 marks – TOTAL: 7 marks]**

The first three terms of an arithmetic sequence are, in order $m + 2$, 8 and $5m + 2$.

a) Determine the value of m.

b) Hence, write the first three terms of the sequence.

c) State the explicit rule that describes the arithmetic progression above, and hence determine the 99th term of the sequence.