**IB Math SL 1 - Exponents and Logarithms Test** / 41 marks Name____________

**No calculator part. Show all work. Clearly circle your final answers.**

**1.** Let ln $a = p$, ln $b = q$. Write the following expressions in terms of $p$ and $q$.

(a) $\ln ab^3$ (b) $\ln\left(\frac{a}{\sqrt{b}}\right)$ **(Total 6 marks)**

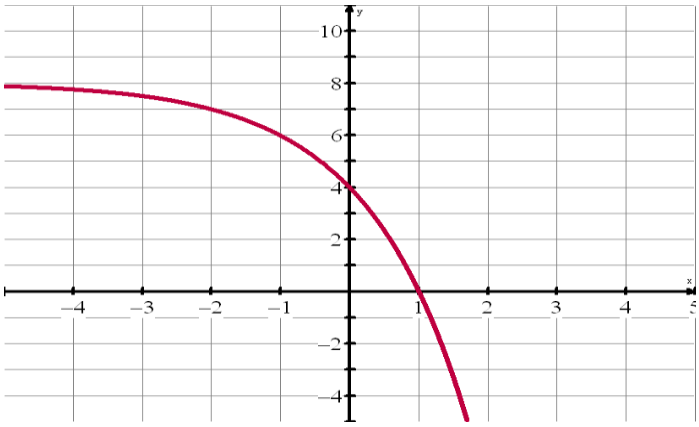
**2.** Solve for $x$ if $27^{5-3x} = \frac{1}{\sqrt{3^{6x-2}}}$ **(Total 4 marks)**

**3.** (a) Let $\log_4 6 = p$ and $\log_4 11 = q$. Find an expression in terms of $p$ and $q$ for $\log_{11} 6$.

(b) Find the value of $d$ if $\log_d 5 = \frac{1}{3}$.

**(Total 5 marks)**

**4.** The graph below shows the curve $y = k(2^x) + c$, where $k$ and $c$ are constants. Find the values of $c$ and $k$.




**(Total 3 marks)**

**5.** Find the **exact** value of $x$ in each of the following equations.

(a) $6^{1-2x} = 360$ (b) $\log_{2a}(2x+4) = -1$ **(Total 7 marks)**

**6.** Consider $g(x) = -2\ln(5-2x)+8$.

(a) State the domain of $g(x)$.

(b) State the range of $g$(x)

(c) Find the equation of $g^{-1}(x)$. **(Total 7 marks)**

**7.** Solve the equation $\log_8 16 + \log_8 ¼ - \log_8 128 = \log_8 x$ for $x$. **(Total 3 marks)**

**8.** Solve the equation $\log_{16} 36 = 1 - \log_4 x$ for $x$. **(Total 6 marks)**

**Calculator part. Show all work. Write answers on separate paper. Clearly circle your final answers.**

**9.** It is thought that a computer virus would spread in an office according to an exponential model. 6 computers were infected initially. The number of computers infected hearing it grows at a rate of 11% per hour.

(a) How many computers were infected after 24 hours? **(3)**

There are 8,200 computers in the office.

(b) How long it would take for all computers in the office to be infected. **(3)**

**10.** A city is concerned about pollution, and decides to look at the number of people using taxis. At the end of the year 2000, there were 300 taxis in the city. After $n$ years the number of taxis, $T$, in the city is given by

$$T = 300 \times 1.12^n.$$

(a) (i) Find the number of taxis in the city at the end of 2006. **(2)**

(b) (i) After how many years will the number of taxis be double the number of taxis that there were at the end of 2000?

(ii) Find the year in which this will occur.

**(5)**

(c) At the end of 2000 there were 32 000 people in the city who used taxis. After $n$ years the number of people, $P$, in the city who used taxis is given by

$$P(n) = \frac{3,200,000}{15 + 85e^{-0.12n}}$$

(i) Find the value of $P$ at the end of 2006, giving your answer to the nearest whole number.

(ii) After ten complete years, will the value of $P$ be double its value at the end of 2000? Justify your answer.

**(6)**

(d) Let $R$ be the ratio of the number of people using taxis in the city to the number of taxis. The city will reduce the number of taxis if $R < 65$.

(i) Find the value of $R$ at the end of 2000.

(ii) After how many years will the city first reduce the number of taxis?

(iii) During which year will the city first start reducing the number of taxis?

**(5)**
**(Total 18 marks)**

# Write all answers on separate paper, NOT HERE!