IB MATHS AI SL · UNIT 2

Solving Equations: exam practice

10 questions · 27 marks · worked solutions and markschemes

Name _____ Date _____ Score / 27

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/slai/solving-equations-exam-practice

1. **2 marks · Paper 1 style · calculator allowed**

Solve $4^x = 30$. **[2]**

2. **2 marks · Paper 1 style · calculator allowed**

Solve $2e^{0.3x} = 15$. **[2]**

3. **2 marks · Paper 1 style · calculator allowed**

Solve $\ln(2x + 1) = 3$. **[2]**

4. **3 marks · Paper 1 style · calculator allowed**

Consider the exponential equation $2(3)^x = 162$.

By finding a common base, solve for the exact value of x without using a calculator.

5. **2 marks · Paper 1 style · calculator allowed**

An investment of €100 grows by 8% each year.

Find the time, in years, for the investment to reach €250. **[2]**

6. **3 marks · Paper 1 style · calculator allowed**

Solve $3^{x+1} = 5^x$. **[3]**

7. **3 marks · Paper 2 style · calculator allowed**

Use your calculator to solve $e^x = x + 4$. **[3]**

8. **4 marks · Paper 1 style · calculator allowed**

The equation $\log_{10}(2x) + \log_{10}(x + 15) = 2$ has one real solution.

Find it, explaining why any other value is rejected. **[4]**

9. **2 marks · Paper 2 style · calculator allowed**

Use your calculator to find the negative solution of $x^2 = 2^x$. **[2]**

10. **4 marks · Paper 2 style · calculator allowed**

Consider the functions $f(x) = e^{0.4x}$ and $g(x) = x^2 + 5$.

Using your Graphic Display Calculator, find the coordinates of the point of intersection of the graphs of $f(x)$ and $g(x)$ for $x > 0$. Give your answers correct to 3 significant figures.

Answers and worked solutions

Question 1 — 2 marks

Answer: $x = 2.45$

$x = \log_4 30$ or GDC **(M1)**

$x = 2.45$ **A1**

Question 2 — 2 marks

Answer: $x = 6.72$

$e^{0.3x} = 7.5$ **(M1)**

$x = 6.72$ **A1**

Question 3 — 2 marks

Answer: $x = 9.54$

$2x + 1 = e^3$ **(M1)**

$x = 9.54$ **A1**

Question 4 — 3 marks

Answer: 4

Divide both sides by 2: $3^x = 81$ **M1**

Write 81 as a power of 3:

$81 = 3^4$, so $3^x = 3^4$ **M1**

Equate exponents: $x = 4$ **A1**

Question 5 — 2 marks

Answer: 11.9 years

$100(1.08)^n = 250$ **(M1)**

11.9 years **A1**

Question 6 — 3 marks

Answer: $x = 2.15$

$(x + 1)\ln 3 = x \ln 5$ **M1**

$x = \dfrac{\ln 3}{\ln 5 - \ln 3}$ **(A1)**

$x = 2.15$ **A1**

Question 7 — 3 marks

Answer: $x = -3.98$ or $x = 1.75$

graphs of $y = e^x$ and $y = x + 4$ **(M1)**

$x = -3.98$ **A1**

$x = 1.75$ **A1**

Question 8 — 4 marks

Answer: $x = 2.81$

$\log_{10}(2x(x + 15)) = 2$, so $2x^2 + 30x = 100$ **M1**

$x^2 + 15x - 50 = 0$ **A1**

$x = \dfrac{-15 \pm \sqrt{425}}{2}$ **(A1)**

$x = 2.81$ (the negative root makes $\log_{10}(2x)$ undefined) **A1**

Question 9 — 2 marks

Answer: $x = -0.767$

graphs of $y = x^2$ and $y = 2^x$ **(M1)**

$x = -0.767$ **A1**

Question 10 — 4 marks

Answer: $(12.8, 170)$

Equate the functions:

$e^{0.4x} = x^2 + 5$ **M1**

Plot both graphs on the GDC and use the intersect tool for $x > 0$ **M1**

$x \approx 12.8$ **A1**

$y \approx 170$, so the point is $(12.8, 170)$ **A1**

Every solution is also on ibmathrevision.com/slai/solving-equations-exam-practice
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