Graphing Linear, Quadratic, Exponential and Logarithmic Functions: exam practice

10 questions · 38 marks · worked solutions and markschemes

Name _____ Date _____ Score / 38

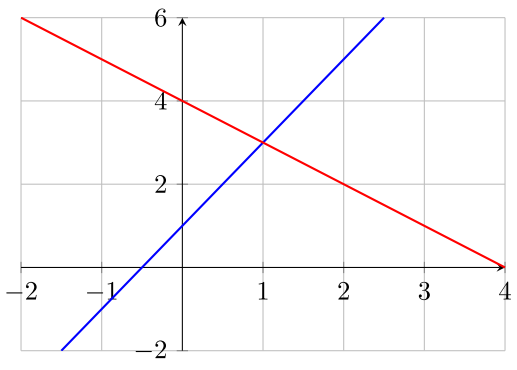
- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/slai/graphing-linear-quadratic-exponential-and-logarithmic-functions-exam-practice

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

Use your calculator to find the coordinates of the point where the graphs of $y = 3e^{-0.5x}$ and $y = x$ meet. **[2]**

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

The graphs of two linear functions, $L_1 : y = 2x + 1$ and $L_2 : y = -x + 4$, are shown below.



By solving the equation $2x + 1 = -x + 4$ algebraically, find the exact coordinates of their point of intersection.

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

Let $f(x) = x^3 - 3x^2 - 9x + 5$. Use technology to answer the following.

a. Write down the y-intercept of the graph of f. **[1]**

b. Find the coordinates of the local maximum point. **[1]**

c. Find the coordinates of the local minimum point. **[1]**

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

The graph of $y = x^2$ is transformed to the graph of $y = (x - 2)^2 + 3$.

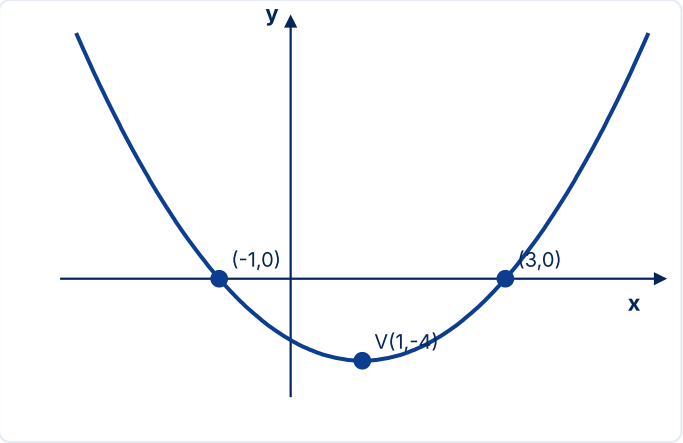
(a) Describe the transformation. **[2]**

(b) Write down the coordinates of the vertex of the new graph. **[1]**

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

The graph of a quadratic function $y = x^2 - 2x - 3$ is shown below.

1. Write down the coordinates of the x-intercepts.
2. Write down the equation of the axis of symmetry.
3. Find the exact coordinates of the vertex.



6. **4 marks · Paper 1 style · calculator allowed**

The point $(4, -1)$ lies on the graph of $y = f(x)$.

(a) Write down the image of this point on the graph of $y = 3f(x)$. **[1]**

(b) Write down the image of this point on the graph of $y = f\left(\frac{x}{2}\right)$. **[1]**

(c) Describe the transformation in part (b). **[2]**

7. **4 marks · Paper 1 style · calculator allowed**

The graph of $y = 2^x$ is reflected in the x-axis and then translated 4 units up.

(a) Write down the equation of the new graph. **[1]**

(b) Find the x-intercept of the new graph. **[2]**

(c) Write down the equation of its horizontal asymptote. **[1]**

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

Let $f(x) = \ln(x + 3)$.

(a) Write down the domain of f. **[1]**

(b) Write down the equation of the vertical asymptote. **[1]**

(c) Find the x-intercept and the y-intercept. **[2]**

9. **5 marks · Paper 2 style · calculator allowed**

Let $f(x) = x^3 - 6x + 2$.

(a) Use your calculator to find the zeros of f. **[3]**

(b) Find the coordinates of the local maximum point. **[2]**

10. **5 marks · Paper 1 style · calculator allowed**

Let $f(x) = -2x^2 + 8x - 3$.

(a) Find the coordinates of the vertex. **[2]**

(b) Use your calculator to find the x-intercepts. **[2]**

(c) Write down the range of f. **[1]**

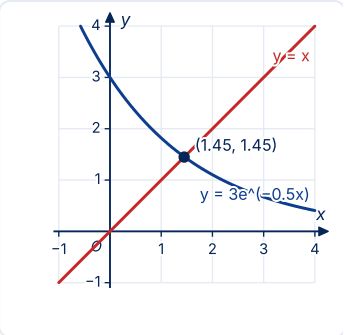
Answers and worked solutions

Question 1

2 marks

Answer: $(1.45,\ 1.45)$

$(1.45,\ 1.45)$ A1A1



Intersection (1.45, 1.45)

Question 2

3 marks

Answer: $(1, 3)$

Collect x—terms on one side:

$2x + x = 4 - 1 \implies 3x = 3$ M1

$x = 1$ A1

Substitute $x = 1$ into L_1:

$y = 2(1) + 1 = 3$

Point of intersection: $(1, 3)$ A1

Question 3

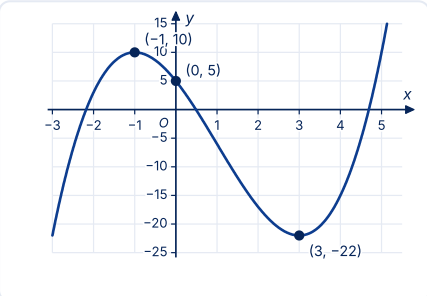
3 marks

Answer: (a) $(0, 5)$; (b) $(-1, 10)$; (c) $(3, -22)$

a. $(0, 5)$ A1

b. $(-1, 10)$ A1

c. $(3, -22)$ A1



Maximum $(-1, 10)$; minimum $(3, -22)$

Question 4

3 marks

Answer: (b) $(2, 3)$

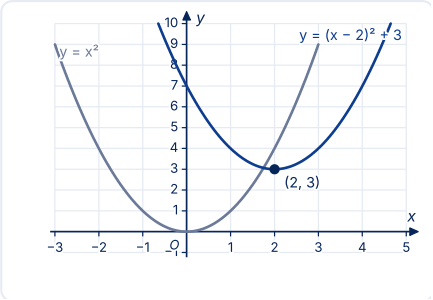
(a)

translation A1

by $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ A1

(b)

$(2, 3)$ A1



Vertex (2, 3)

Question 5

5 marks

Answer: (a) $(-1, 0), (3, 0)$; (b) $x = 1$; (c) $(1, -4)$

1. x—intercepts at $(-1, 0)$ and $(3, 0)$. A1A1
2. Axis of symmetry is exactly halfway between roots: $x = \frac{-1+3}{2} = 1$. (M1)A1
3. Vertex $x = 1$. $y = (1)^2 - 2(1) - 3 = -4$. Vertex is $(1, -4)$. A1

Question 6

4 marks

Answer: (a) $(4, -3)$; (b) $(8, -1)$

(a)

$(4, -3)$ A1

(b)

$(8, -1)$ A1

(c)

horizontal stretch A1

scale factor 2 A1

Question 7

4 marks

Answer: (a) $y = 4 - 2^x$; (b) 2; (c) $y = 4$

(a)

$y = 4 - 2^x$ A1

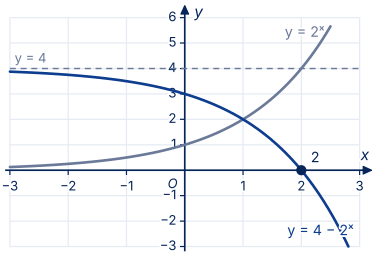
(b)

$2^x = 4$ (M1)

$x = 2$ A1

(c)

$y = 4$ A1



x-intercept 2; asymptote $y = 4$

Question 8

4 marks

Answer: (a) $x > -3$; (b) $x = -3$; (c) $(-2, 0)$ and $(0,\ 1.10)$

(a)

$x > -3$ A1

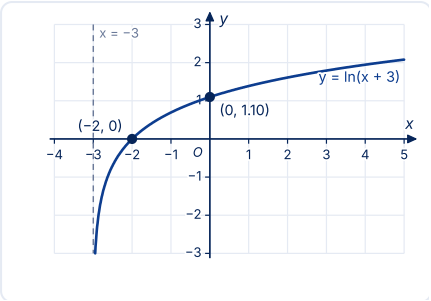
(b)

$x = -3$ A1

(c)

$(-2, 0)$ A1

$(0,\ 1.10)$ A1



Asymptote $x = -3$

Question 9

5 marks

Answer: (a) $x = -2.60,\ 0.340,\ 2.26$; (b) $(-1.41,\ 7.66)$

(a)

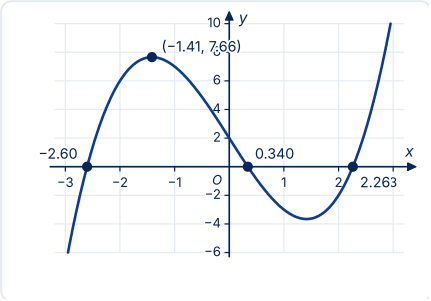
$x = -2.60$ **A1**

$x = 0.340$ **A1**

$x = 2.26$ **A1**

(b)

$(-1.41,\ 7.66)$ **A1A1**



Zeros -2.60, 0.340, 2.26

Question 10

5 marks

Answer: (a) $(2, 5)$; (b) $x = 0.419$ and $x = 3.58$; (c) $f(x) \leq 5$

(a)

$$x = -\frac{8}{2(-2)} = 2 \text{ (M1)}$$

$(2, 5)$ **A1**

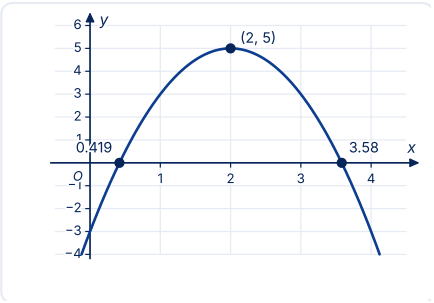
(b)

$x = 0.419$ **A1**

$x = 3.58$ **A1**

(c)

$f(x) \leq 5$ **A1**



Vertex (2, 5); range $f(x) \leq 5$

Every solution is also on ibmathrevision.com/slai/graphing-linear-quadratic-exponential-and-logarithmic-functions-exam-practice
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