IB MATHS AA HL · UNIT 2

Graphing Functions: exam practice

10 questions · 39 marks · worked solutions and markschemes

Name _____ Date _____ Score / 39

- 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/hlaa/graphing-functions-exam-practice

1. **3 marks · Paper 1 style · no calculator**

A parabola has vertex $(-3, 4)$ and passes through $(-1, -4)$.

Find its equation in the form $y = a(x - h)^2 + k$. **[3]**

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

Use your GDC to find the coordinates of the points of intersection of $y = e^x$ and $y = x + 3$.

Find the points. **[4]**

3. **3 marks · Paper 1 style · no calculator**

The graph of $y = -2(x - 1)^2 + 8$ is drawn.

(a) Write down the coordinates of the vertex. **[1]**

(b) Find the x-intercepts. **[2]**

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

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

(a) Find the x-intercepts of the graph of f. **[2]**

(b) Use your GDC to find the coordinates of the local maximum. **[2]**

5. **4 marks · Paper 1 style · no calculator**

Let $f(x) = \dfrac{4}{x-1} + 2$.

(a) Write down the equations of the asymptotes. **[2]**

(b) Find the intercepts with the axes. **[2]**

6. **4 marks · Paper 2 style · calculator**

Let $f(x) = xe^{-x}$ for $x \geq 0$.

(a) Use your GDC to find the maximum value of f. **[2]**

(b) Solve $f(x) = 0.2$. **[2]**

7. **4 marks · Paper 2 style · calculator**

Let $f(x) = \ln(x+2)$ and $g(x) = 4 - x^2$.

(a) Use your GDC to solve $f(x) = g(x)$. **[2]**

(b) Explain why there is no solution with $-2 < x < 0$. **[2]**

8. **4 marks · Paper 1 style · no calculator**

The graph of $y = f(x)$ has a local maximum at $(2, 5)$ and a local minimum at $(6, -3)$.

(a) Write down the local maximum of $y = f(x) + 4$. **[1]**

(b) Write down the local minimum of $y = -f(x)$. **[2]**

(c) Write down the local maximum of $y = f(2x)$. **[1]**

9. **4 marks · Paper 1 style · no calculator**

Let $f(x) = 2 - e^x$.

(a) Find the intercepts of the graph with the axes. **[2]**

(b) Write down the equation of the asymptote and the range of f. **[2]**

10. **5 marks · Paper 2 style · calculator**

Let $f(x) = \dfrac{x^2 + 1}{x^2 - 4}$.

(a) Write down the equations of all asymptotes. **[3]**

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

Answers and worked solutions

Question 1 — 3 marks

Answer: $y = -2(x+3)^2 + 4$

$y = a(x+3)^2 + 4$ A1

$-4 = 4a + 4$ M1

$y = -2(x+3)^2 + 4$ A1

Question 2 — 4 marks

Answer: $(-2.95,\ 0.0525)$ and $(1.51,\ 4.51)$

attempt to find intersections M1

$(-2.95,\ 0.0525)$ A1A1

$(1.51,\ 4.51)$ A1

Question 3 — 3 marks

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

(a)

$(1, 8)$ A1

(b)

$(x-1)^2 = 4$ M1

$x = -1$, $x = 3$ A1

Question 4 — 4 marks

Answer: (a) $x = -1,\ 1,\ 3$; (b) $(-0.155,\ 3.08)$

(a)

$(x-3)(x-1)(x+1) = 0$ M1

$x = -1,\ 1,\ 3$ A1

(b)

$(-0.155,\ 3.08)$ A1A1

Question 5 — 4 marks

Answer: (a) $x = 1$, $y = 2$; (b) $(0, -2)$ and $(-1, 0)$

(a)

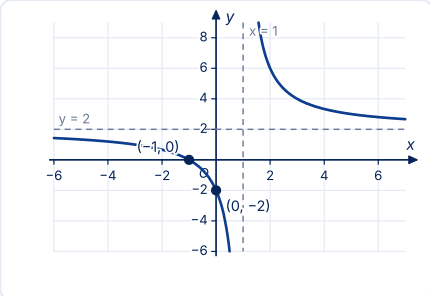
$x = 1$ A1

$y = 2$ A1

(b)

$(0, -2)$ A1

$(-1, 0)$ A1



Asymptotes $x = 1$, $y = 2$

Question 6 — 4 marks

Answer: (a) 0.368; (b) $x = 0.259$, $x = 2.54$

(a)

at $x = 1$ A1

$f(1) = 0.368$ A1

(b)

$x = 0.259$ A1

$x = 2.54$ A1

Question 7 — 4 marks

Answer: (a) $x = 1.65$

(a)

attempt to find the intersection M1

$x = 1.65$ A1

(b)

for $-2 < x \leq -1$,

$f(x) \leq 0 < g(x)$ R1

for $-1 < x < 0$,

$f(x) < \ln 2 < 3 < g(x)$ R1

Question 8 — 4 marks

Answer: (a) $(2, 9)$; (b) $(2, -5)$; (c) $(1, 5)$

(a)

$(2, 9)$ A1

(b)

the maximum becomes a minimum M1

$(2, -5)$ A1

(c)

$(1, 5)$ A1

Question 9 — 4 marks

Answer: (a) $(0, 1)$ and $(\ln 2, 0)$; (b) $y = 2$; $f(x) < 2$

(a)

$(0, 1)$ A1

$(\ln 2, 0)$ A1

(b)

$y = 2$ A1

$f(x) < 2$ A1

Question 10 — 5 marks

Answer: (a) $x = \pm 2$, $y = 1$; (b) $\left(0, -\frac{1}{4}\right)$

(a)

$x = 2$ A1

$x = -2$ A1

$y = 1$ A1

(b)

at $x = 0$ A1

$\left(0, -\frac{1}{4}\right)$ A1

Every solution is also on ibmathrevision.com/hlaa/graphing-functions-exam-practice
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