

Funciones 1

Programa Diploma BI

Nombre:

FECHA:

1. Given that $f(x) = 2e^{3x}$, find the inverse function $f^{-1}(x)$.

Working:

Answers:

(Total 4 marks)

2. The functions $f(x)$ and $g(x)$ are given by $f(x) = \sqrt{x-2}$ and $g(x) = x^2 + x$. The function $(f \circ g)(x)$ is defined for $x \in \mathbb{R}$, **except** for the interval $]a, b[$.

- (a) Calculate the value of a and of b .
(b) Find the range of $f \circ g$.

Working:

Answers:

- (a)
(b)

(Total 6 marks)

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3. Consider the functions $f: x \mapsto 4(x - 1)$ and $g: x \mapsto \frac{6-x}{2}$.
- (a) Find g^{-1} .
- (b) Solve the equation $(f \circ g^{-1})(x) = 4$.

Working:

Answers:

- (a)
- (b)

(Total 6 marks)

4. Let $f(x) = 2^x$, and $g(x) = \frac{x}{x-2}$, ($x \neq 2$).

Find

- (a) $(g \circ f)(3)$;
- (b) $g^{-1}(5)$.

Working:

Answers:

- (a)
- (b)

(Total 6 marks)

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5. Consider the function $f : x \mapsto \sqrt{x+1}$, $x \geq -1$

- (a) Determine the inverse function f^{-1} .
- (b) What is the domain of f^{-1} ?

Working:

Answers:

- (a)
- (b)

(Total 4 marks)

6. The function f is defined by

$$f : x \mapsto \sqrt{3-2x}, \quad x \leq \frac{3}{2}.$$

Evaluate $f^{-1}(5)$.

Working:

Answers:

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(Total 4 marks)

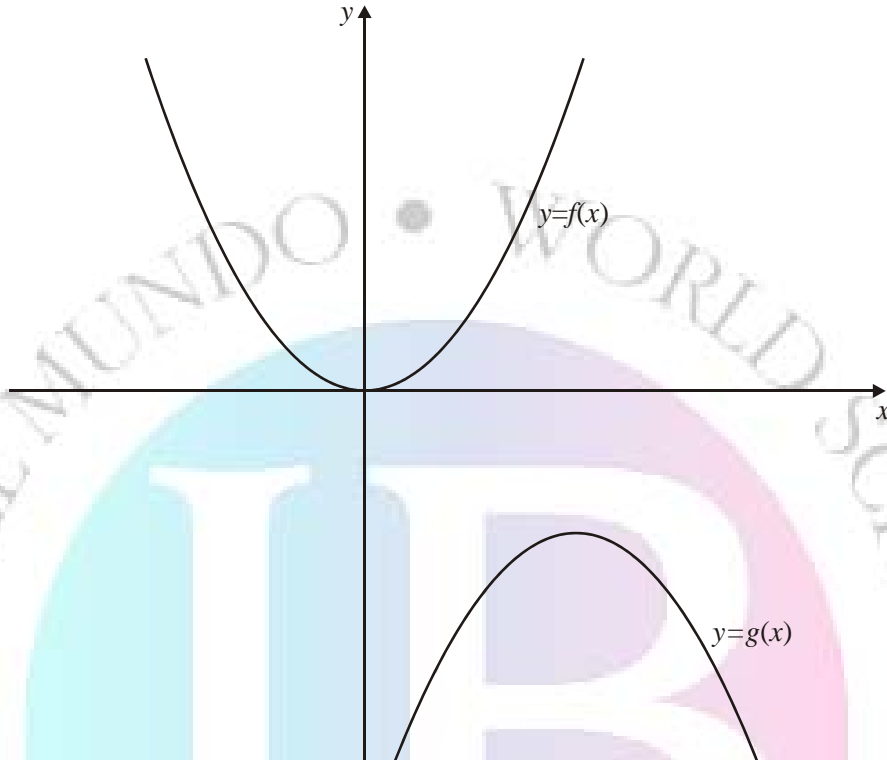
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7. The diagram shows a sketch of part of the graph of $f(x) = x^2$ and a sketch of part of the graph of $g(x) = -x^2 + 6x - 13$



- (a) Write down the coordinates of the maximum point of $y = g(x)$.

The graph of $y = g(x)$ can be obtained from the graph of $y = f(x)$ by **first** reflecting the graph of $y = f(x)$, **then** translating the graph of $y = f(x)$.

- (b) Describe fully each of these transformations, which together map the graph of $y = f(x)$ onto the graph of $y = g(x)$.

Working:

Answers:

- (a)
- (b)



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(Total 3 marks)



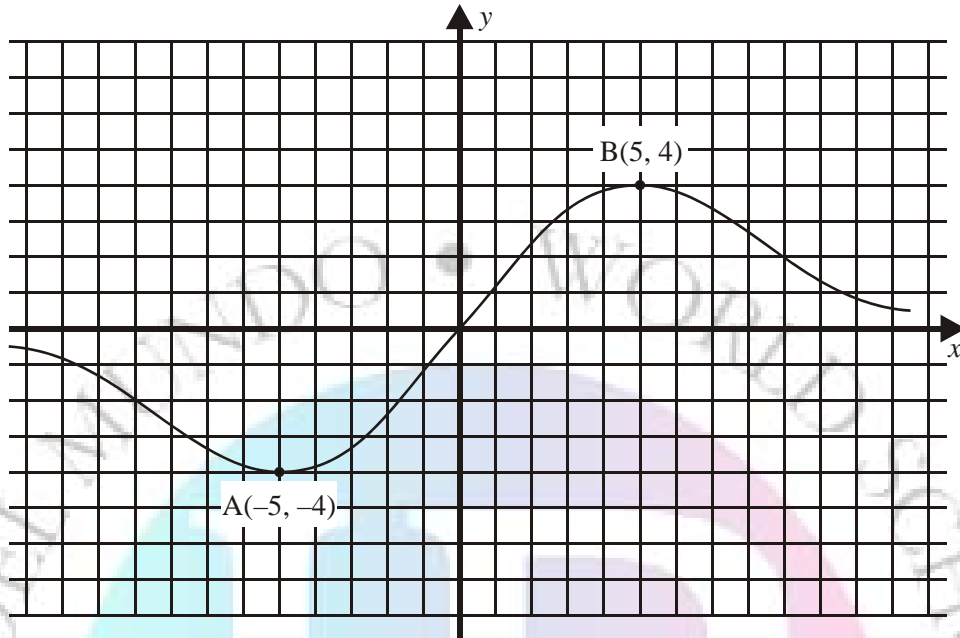
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8. The diagram shows the graph of $y = f(x)$, with the x -axis as an asymptote.



- (a) On the same axes, draw the graph of $y = f(x + 2) - 3$, indicating the coordinates of the images of the points A and B.
- (b) Write down the equation of the asymptote to the graph of $y = f(x + 2) - 3$.

Working:

Answers:

(b)

(Total 4 marks)

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9. A group of ten leopards is introduced into a game park. After t years the number of leopards, N , is modelled by $N = 10 e^{0.4t}$.
- (a) How many leopards are there after 2 years?
- (b) How long will it take for the number of leopards to reach 100? Give your answers to an appropriate degree of accuracy.

Give your answers to an appropriate degree of accuracy.

Working:

Answers:

- (a)
- (b)

(Total 4 marks)

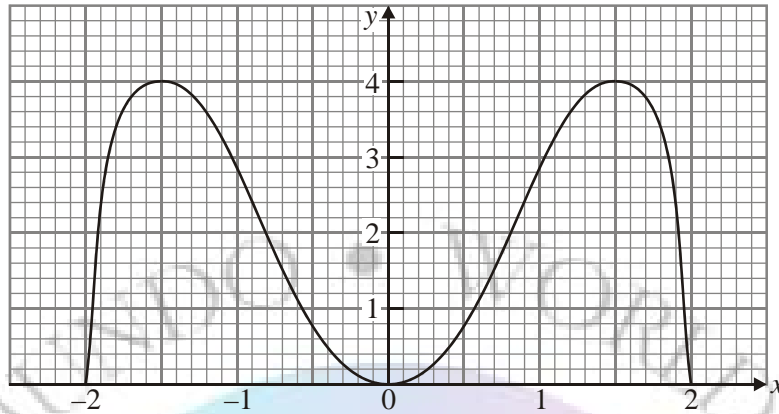
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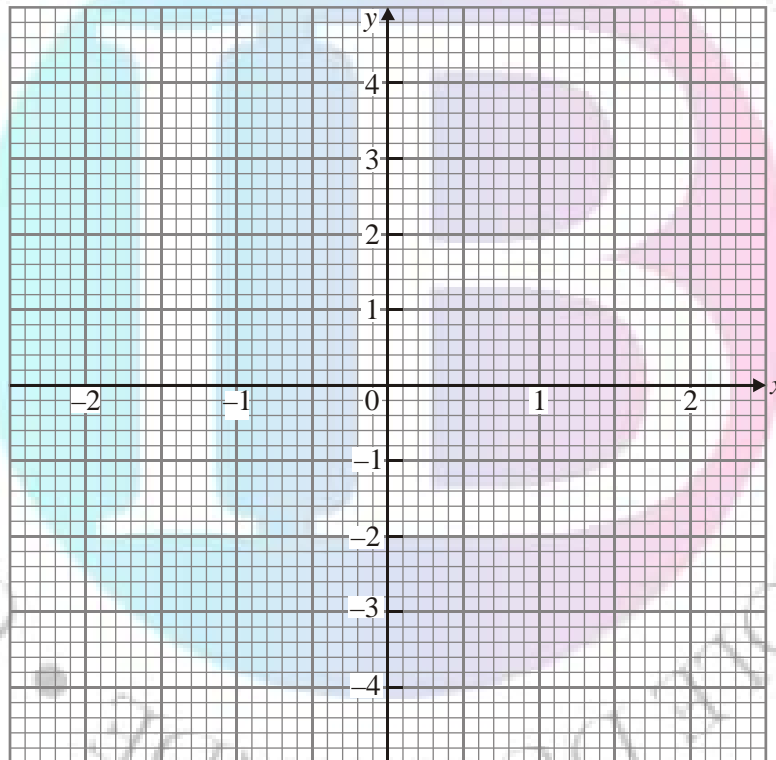
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10. The following graph is that part of the graph of $y = f(x)$ for which $f(x) \geq 0$.



Sketch, on the axes provided below, the graph of $y^2 = f(x)$ for $-2 \leq x \leq 2$.



(Total 3 marks)

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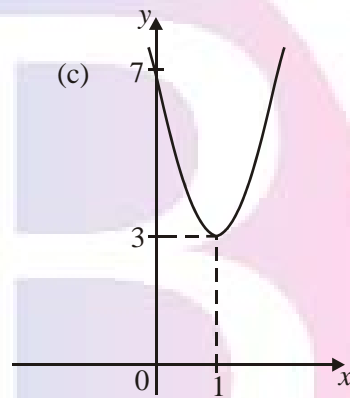
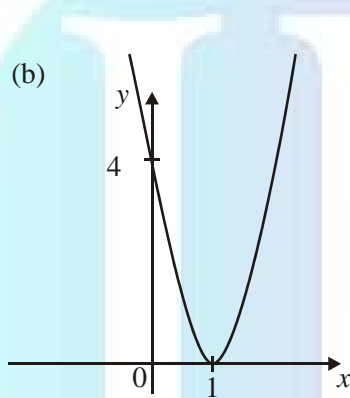
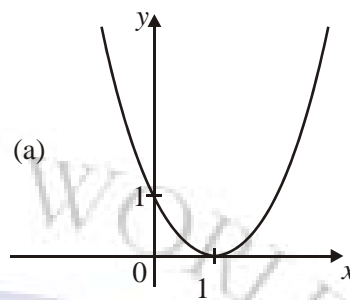
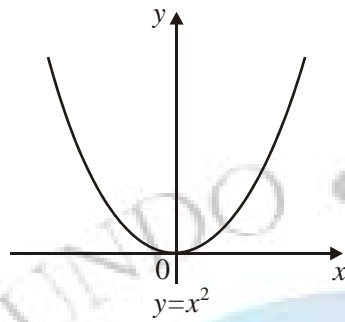
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11. The diagrams show how the graph of $y = x^2$ is transformed to the graph of $y = f(x)$ in three steps.

For each diagram give the equation of the curve.



Working:

Answers:

- (a)
- (b)
- (c)

(Total 4 marks)

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12. Given functions $f: x \mapsto x + 1$ and $g: x \mapsto x^3$, find the function $(f \circ g)^{-1}$.

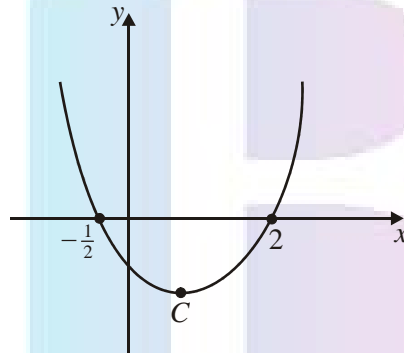
Working:

Answers:.....

(Total 3 marks)

13. The diagram represents the graph of the function

$$f: x \mapsto (x - p)(x - q).$$



- (a) Write down the values of p and q .
- (b) The function has a minimum value at the point C . Find the x -coordinate of C .

Working:

Answers:

(a)

(b)

(Total 4 marks)

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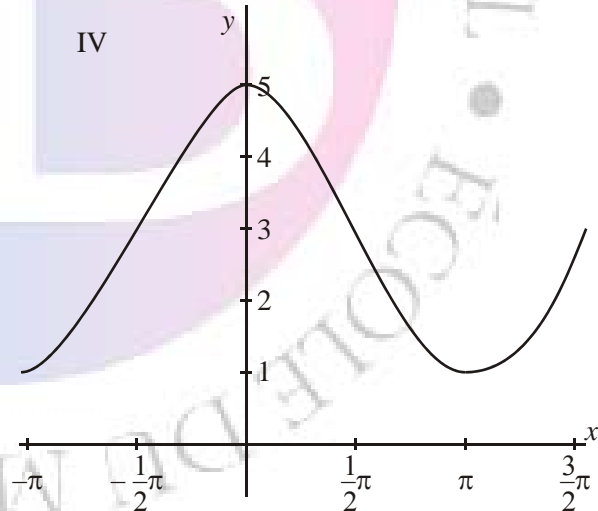
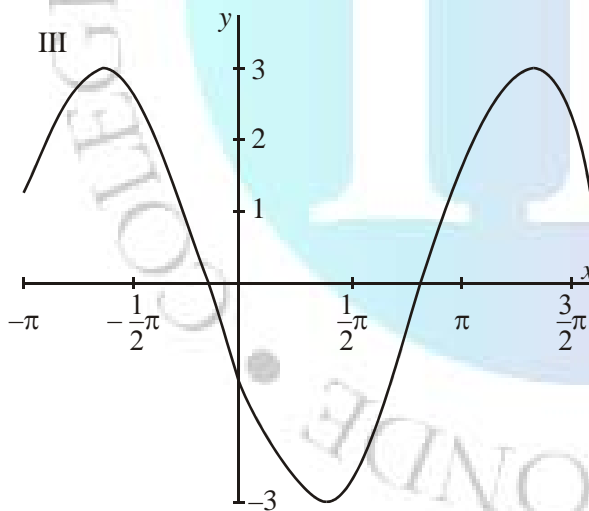
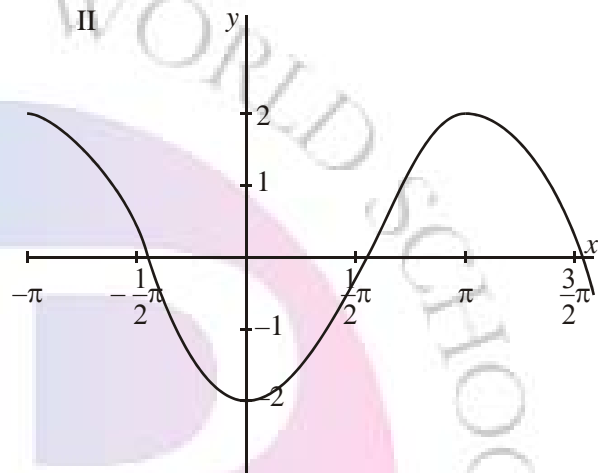
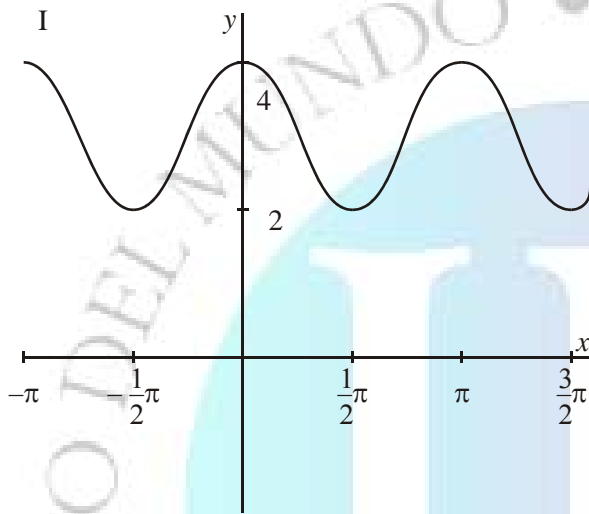
14. Three of the following diagrams I, II, III, IV represent the graphs of

(a) $y = 3 + \cos 2x$

(b) $y = 3 \cos(x + 2)$

(c) $y = 2 \cos x + 3.$

Identify which diagram represents which graph.



Answers:

(a)

(b)

(c)

(Total 4 marks)

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15. The function f is given by $f(x) = \sqrt{\ln(x-2)}$. Find the domain of the function.

Working:

Answers:

.....

(Total 4 marks)

16. A population of bacteria is growing at the rate of 2.3 % per minute. How long will it take for the size of the population to double? Give your answer to the nearest minute.

Working:

Answers:

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(Total 4 marks)

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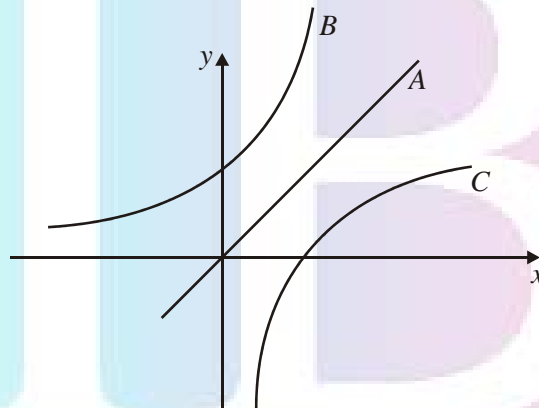
17. For which values of the real number x is $|x + k| = |x| + k$, where k is a positive real number?

Working:

Answers:

(Total 4 marks)

18. The diagram shows three graphs.



A is part of the graph of $y = x$.

B is part of the graph of $y = 2^x$.

C is the reflection of graph B in line A. Write down

- the equation of C in the form $y = f(x)$;
- the coordinates of the point where C cuts the x -axis.

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Working:

Answers:

(a)

(b)

(Total 4 marks)

19. Two functions f, g are defined as follows:

$$f: x \rightarrow 3x + 5$$

$$g: x \rightarrow 2(1 - x)$$

Find

(a) $f^{-1}(2)$;

(b) $(g \circ f)(-4)$.

Working:

Answers:

(a)

(b)

(Total 4 marks)

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20. Let $f(x) = \sqrt{x}$, and $g(x) = 2^x$. Solve the equation

$$(f^{-1} \circ g)(x) = 0.25.$$

Working:

Answers:

(Total 4 marks)

