Year 11 Mathematics Extension 1

Topic: Further Functions (1 of 5)
Review Questions: Graphical Relationships
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

Contents

Reciprocal and absolute-value transforms

1. Reciprocal functions $y = 1/f(x)$
2. Reciprocal trigonometric graphs
3. Absolute value $y = |f(x)|$
4. Absolute value $y = f(|x|)$

Combining and reading graphs

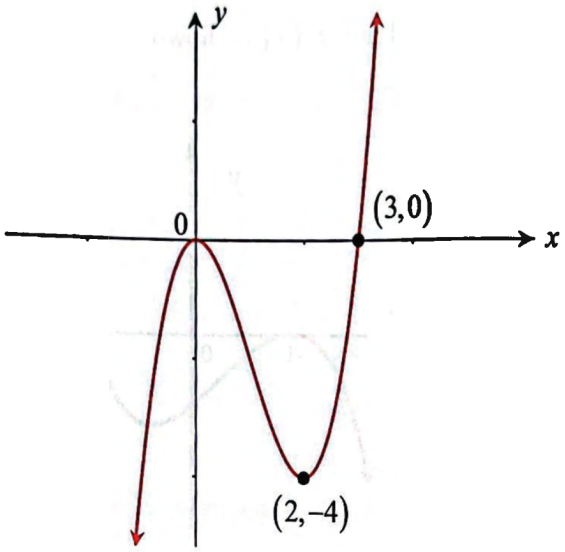
5. Addition of ordinates $y = f(x) \pm g(x)$
6. Solving and counting solutions graphically
7. Identifying a function or transformation from its graph

Reciprocal and absolute-value transforms

1. Reciprocal functions $y = 1/f(x)$

Q1 2022 Knox Trial Q11(a) · **2 marks**

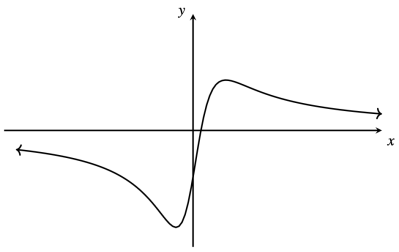
The diagram shows the graph of $y = f(x)$. It passes through the origin, has an x-intercept at $(3, 0)$, and a minimum turning point at $(2, -4)$.



In your writing booklet, sketch the graphs of $y = f(x)$ and $y = \dfrac{1}{f(x)}$ on the same axes. Show any asymptotes and intercepts, together with the location of the points corresponding to the labelled points on $y = f(x)$.

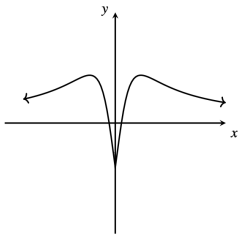
Q2 2024 North Sydney Girls Trial Q6 · **1 mark**

A sketch of the graph of $y = f(x)$ is given below.

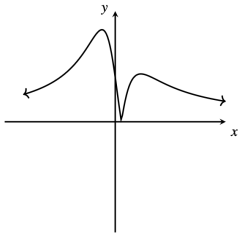


Which of the following is the graph of $y = \frac{1}{f(x)}$?

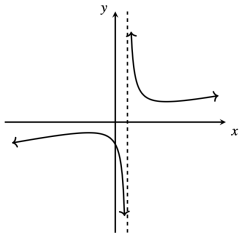
A.



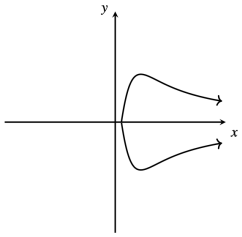
B.



C.



D.



Which of the following is the graph of $y = \dfrac{1}{f(x)}$?

(A) (graph A)

(B) (graph B)

(C) (graph C)

(D) (graph D)

Q3 2024 Hurlstone Prelim Q7 · **1 mark**

Which of the following is the domain of the reciprocal function of $f(x) = x^2 - 1$?

(A) $(-\infty, 1) \cup (1, \infty)$

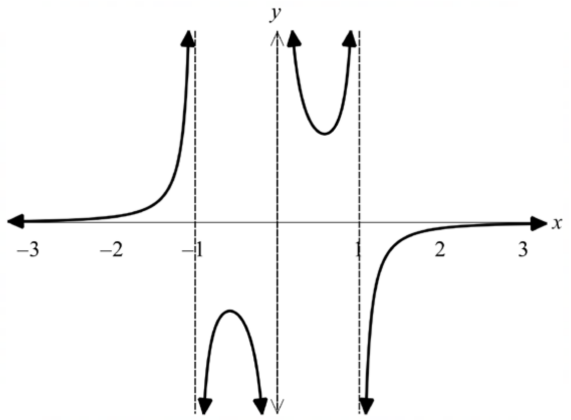
(B) $(-\infty, -1) \cup (-1, \infty)$

(C) $(-\infty, \infty)$

(D) $(-\infty, -1) \cup (-1, 1) \cup (1, \infty)$

Q4 2022 North Sydney Girls Trial Q7 · **1 mark**

The graph below shows $y = \dfrac{1}{f(x)}$.



Which of the following best represents the equation of $f(x)$?

(A) $f(x) = 1 - x^2$

(B) $f(x) = x(x^2 - 1)$

(C) $f(x) = x(1 - x^2)$

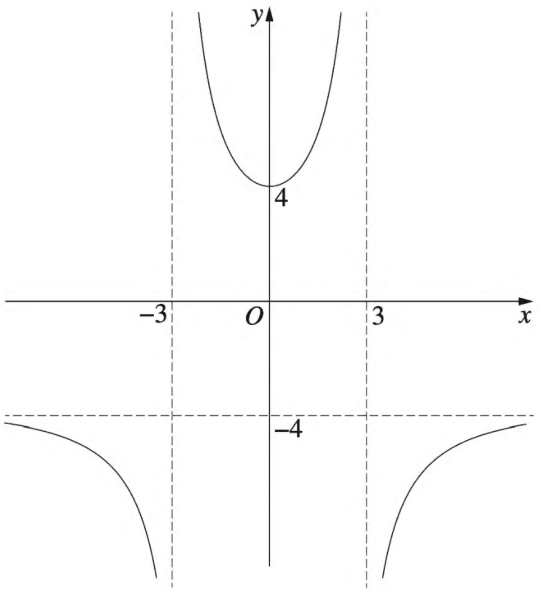
(D) $f(x) = x^2(x^2 - 1)$

Q5 2024 Trinity Grammar Trial Q12(c)(i) · **2 marks**

Consider the function $f(x) = \sqrt{4 - x^2}$. A new function is created such that $g(x) = \dfrac{1}{f(x)}$. Sketch the graph of $y = g(x)$, showing all important features. (You do NOT need to use calculus to verify any points on the graph.)

Q6 2020 Killara Trial Q13(b) · **2 marks**

The diagram shows the graph of $y = f(x)$. It has vertical asymptotes at $x = -3$ and $x = 3$, a horizontal asymptote at $y = -4$, and a minimum turning point at $(0, 4)$.



Draw a half-page diagram of $y = \dfrac{1}{f(x)}$, showing all asymptotes and intercepts.

2. Reciprocal trigonometric graphs

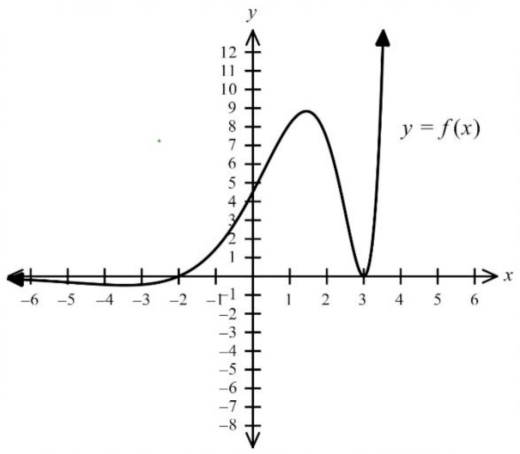
Q7 2022 Barker Trial Q13(c)(i) · **1 mark**

Let the function $f(x) = \sec x$ be defined for the restricted domain $0 \leq x < \dfrac{\pi}{2}$, so that its inverse $f^{-1}(x)$ is also a function. Sketch the graph of $f(x) = \sec x$ within $0 \leq x < \dfrac{\pi}{2}$.

3. Absolute value $y = |f(x)|$

Q8 2022 Glenwood Prelim Q7(d)(i) · 1 mark

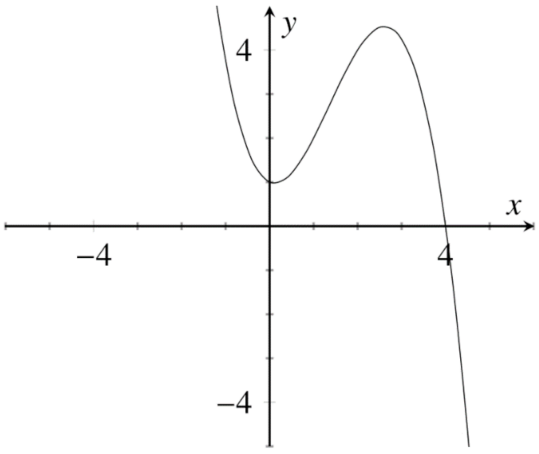
The graph of $y = f(x)$ is shown below, for the domain $(-6, 6)$.



Draw a half-page sketch of $y = |f(x)|$, showing important details.

Q9 2022 Sydney Girls Prelim Q1(f) · 1 mark

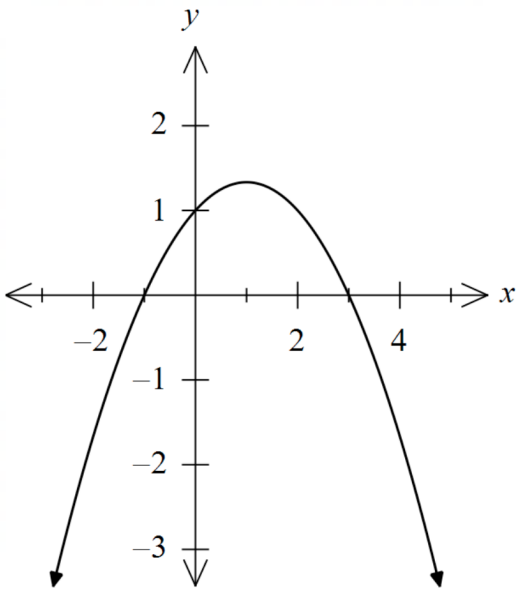
The graph of $y = f(x)$ is shown below.



Sketch the graph of $y = |f(x)|$, showing all important features.

Q10 2022 Knox Prelim Q11(b)(i) · 1 mark

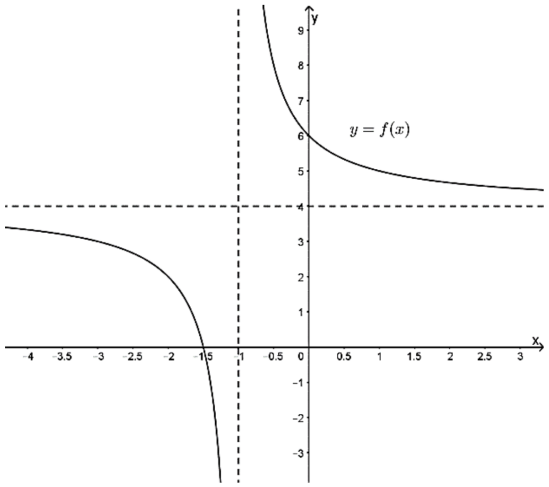
The diagram shows the graph of $y = f(x)$.



Draw the graph of $y = |f(x)|$, showing all asymptotes and intercepts.

Q11 2020 Blacktown Boys Trial Q14(a)(i) · 1 mark

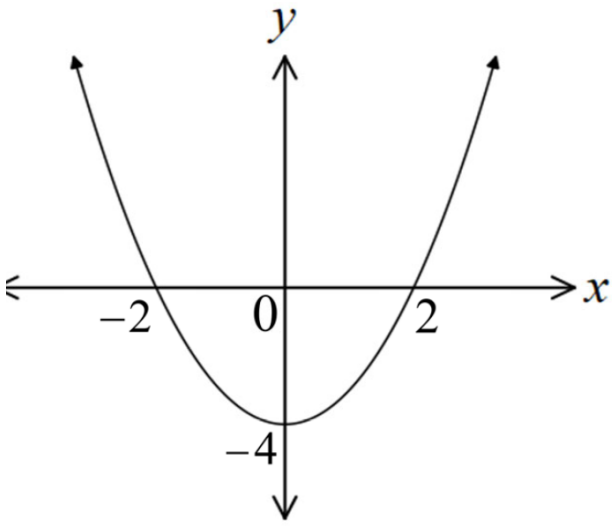
The diagram below is a sketch of the graph of the function $y = f(x)$, where $f(x) = \dfrac{2}{x+1} + 4$.



Draw a half-page graph of $y = |f(x)|$, showing all asymptotes and intercepts.

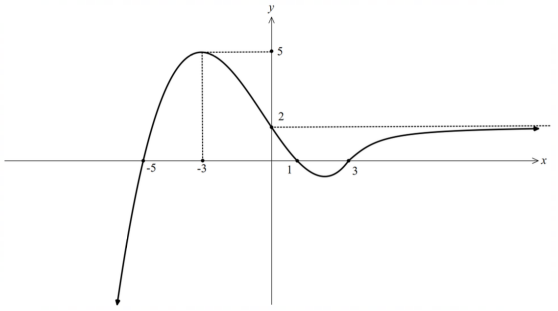
Q12 2025 Ascham Trial Q11(e)(i) · **1 mark**

Consider the graph of the function $f(x) = x^2 - 4$. Sketch the graph of $y = |f(x)|$, showing all key features.



Q13 2023 Pymble Trial Q11(f)(i) · **1 mark**

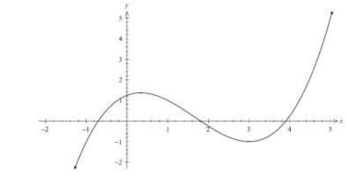
The diagram shows the graph of $y = f(x)$, which has a horizontal asymptote at $y = 2$.



Draw a clear sketch of $y = |f(x)|$, showing all relevant information.

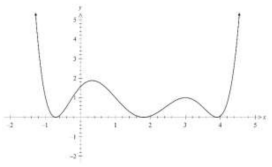
Q14 2021 Moriah Trial Q9 · 1 mark

The graph of the function $y = f(x)$ is drawn below. Which of the following (A, B, C or D) represents the graph of $y = |f(x)|$?

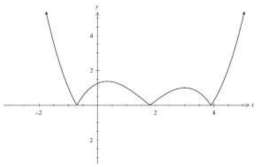


Which of the following represents the graph of $y = |f(|x|)|$?

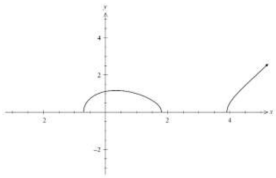
A



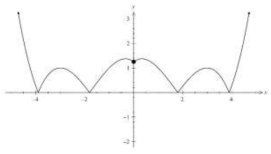
B



C



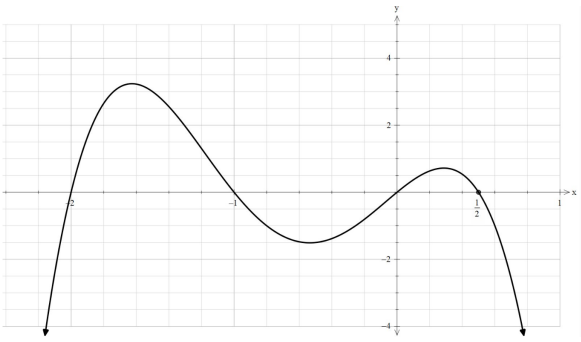
D



4. Absolute value $y = f(|x|)$

Q15 2021 Manly Trial Q13(a)(i) · 1 mark

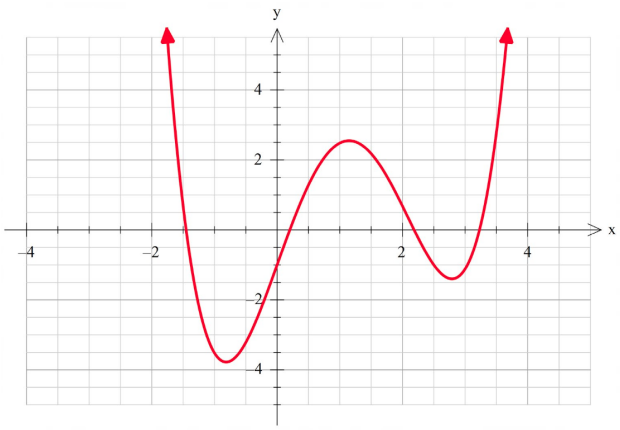
The curve $y = f(x)$ is shown below.



Using the Cartesian plane provided in the answer booklet, sketch the graph of $y = f(|x|)$.

Q16 2024 Newington Trial Q12(c)(i) · **1 mark**

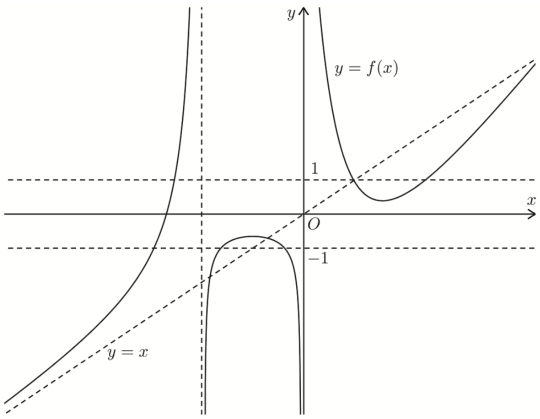
Below is the graph of $f(x)$.



Using the separate sheet provided, sketch the graph of $y = f(|x|)$.

Q17 2025 Sydney Boys Trial Q12(c)(i) · **1 mark**

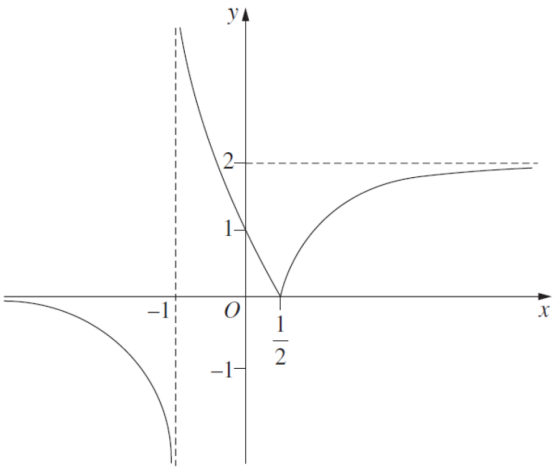
The diagram shows the graph of $y = f(x)$. The line $y = x$ is an asymptote.



On the sheet provided, sketch the graph of $y = f(|x|)$, showing all relevant information.

Q18 2023 Caringbah Trial Q11(b)(i) · **1 mark**

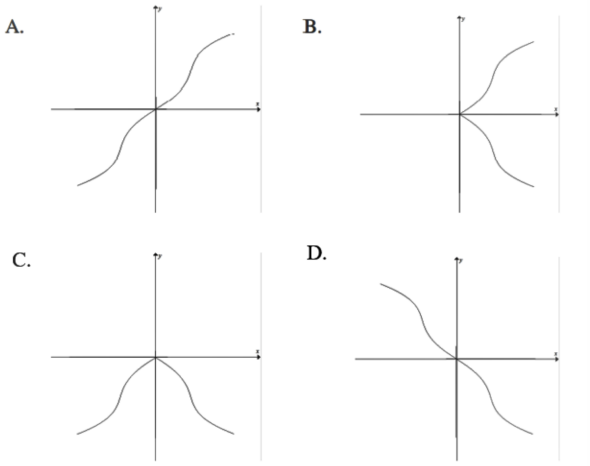
The diagram below shows the graph of $y = f(x)$.



Draw a sketch of $y = f(|x|)$ on a separate number plane.

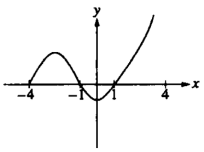
Q19 2022 James Ruse Trial Q2 · **1 mark**

$f(x)$ is an odd function and $f(1) < 0$. Which of the following (A, B, C or D) is a possible graph of $y = f(|x|)$?



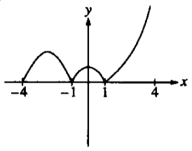
Q20 2022 Baulkham Hills Trial Q2 · **1 mark**

The graph of $y = f(x)$ is shown above the options below. Which of the following (A, B, C or D) could be the graph of $y = f(|x|)$?

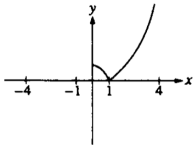


The graph of $y = f(x)$ is shown above. Which of the following could be the graph of $y = f(|x|)$?

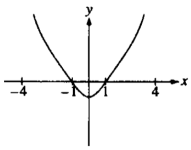
(A)



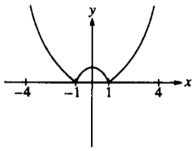
(B)



(C)



(D)

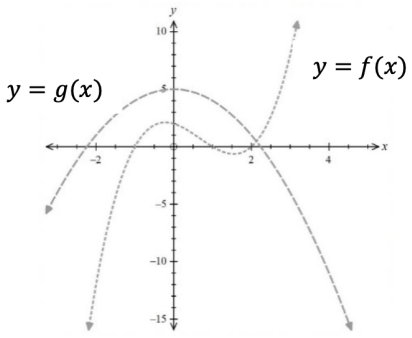


Combining and reading graphs

5. Addition of ordinates $y = f(x) \pm g(x)$

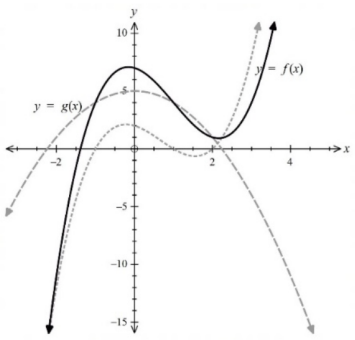
Q21 2022 Barker Trial Q5 · **1 mark**

The graphs of $y = f(x)$ and $y = g(x)$ are shown. Which diagram shows the graph of $y = f(x) + g(x)$?

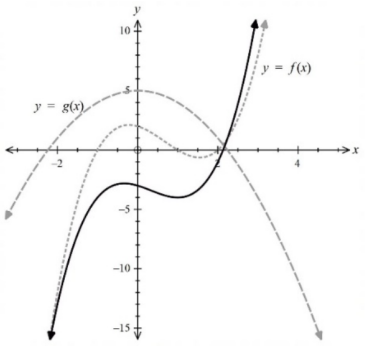


Which diagram shows the graph of $y = f(x) + g(x)$?

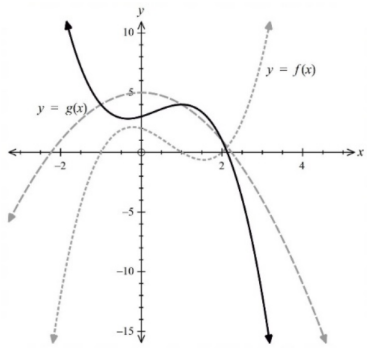
A.



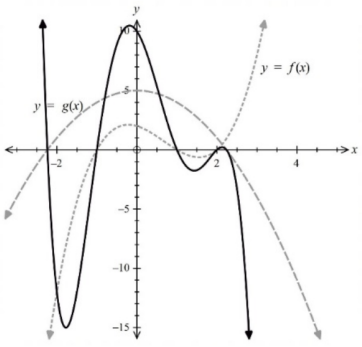
B.



C.

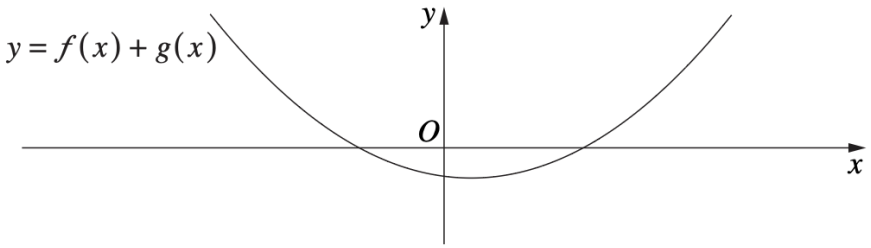


D.



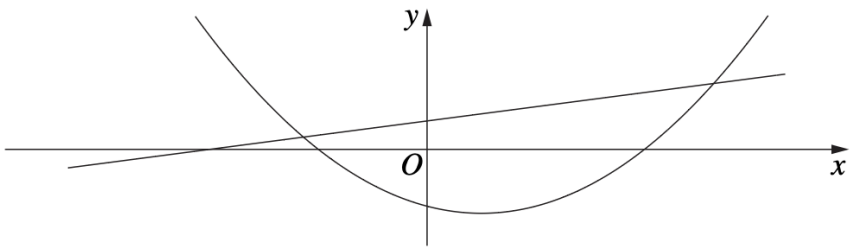
Q22 2022 HSC Q4 · **1 mark**

The diagram shows the graph of the sum of the functions $f(x)$ and $g(x)$. Which of the following best represents the graphs of both $f(x)$ and $g(x)$?

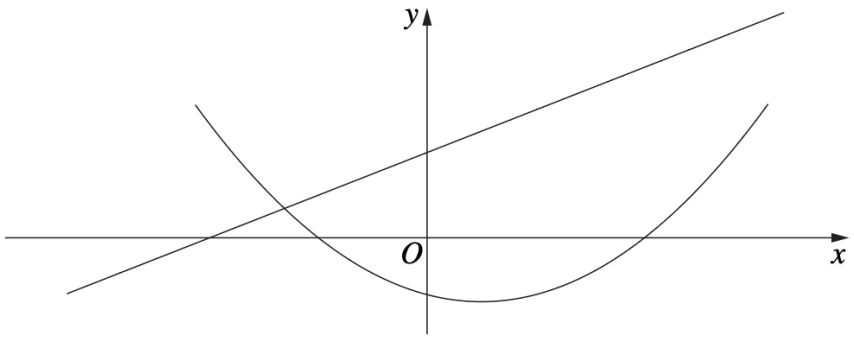


Which of the following best represents the graphs of both $f(x)$ and $g(x)$?

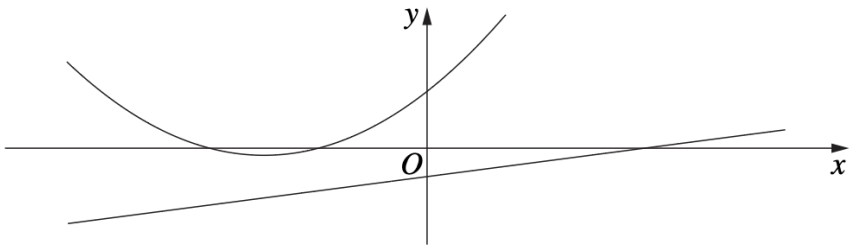
A.



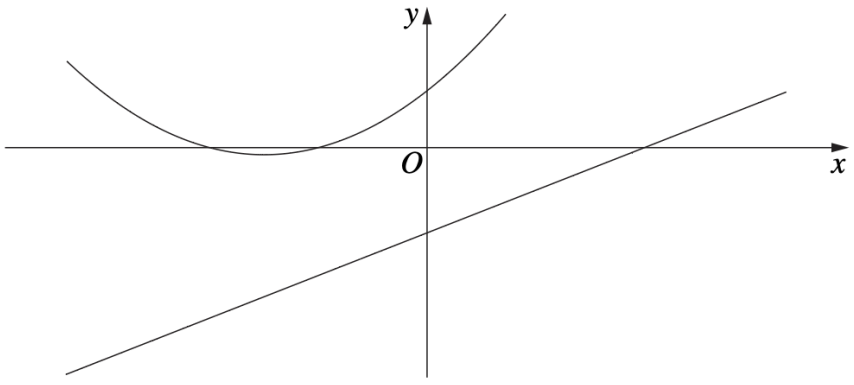
B.



C.

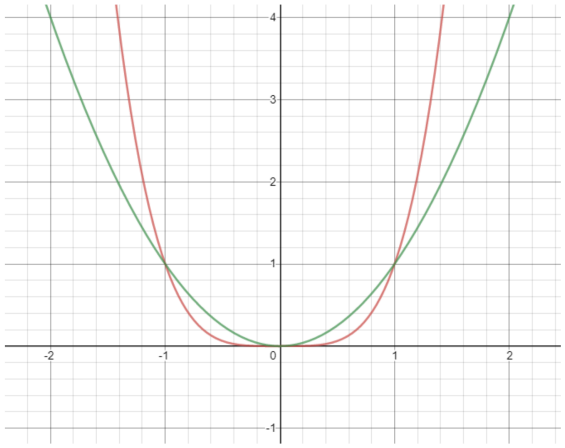


D.



Q23 2020 Knox Prelim Q14(c) · **2 marks**

The diagram shows the graphs of $f(x) = x^4$ and $g(x) = x^2$. Using addition of ordinates, sketch the graph of $y = f(x) - g(x)$, that is $y = x^4 - x^2$, showing all important features.



Q24 2022 Normanhurst Boys Trial Q13(a) · **3 marks**

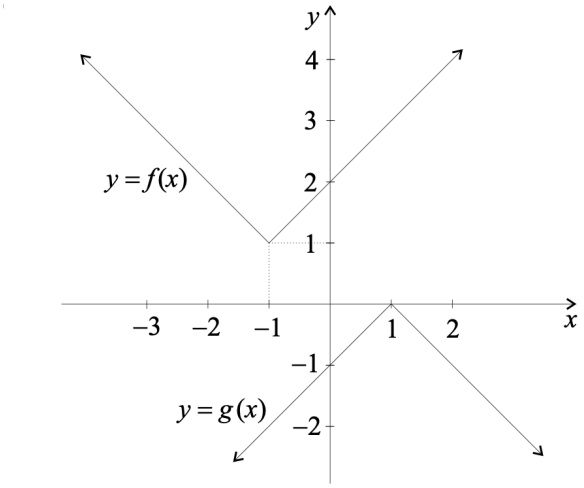
Using addition of ordinates, sketch the graph of

$$y = x - 2\sin x \quad \text{for } 0 \leq x \leq 2\pi,$$

showing all important features.

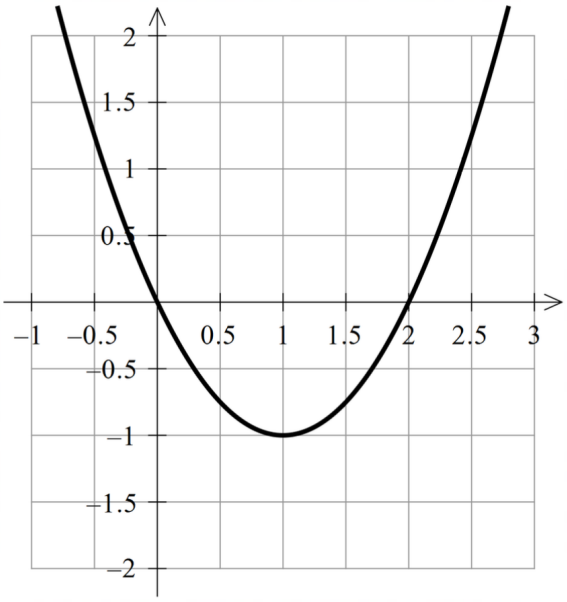
Q25 2021 Sydney Grammar Prelim Q3(c)(i) · **2 marks**

The diagram shows the graphs of the functions $y = f(x)$ and $y = g(x)$. Using addition of ordinates, sketch the graph of $y = f(x) + g(x)$, showing the coordinates of at least three points.



Q26 2023 SCEGGS Prelim Q8(f)(ii) · **2 marks**

The graph of $y = f(x)$ is shown below.

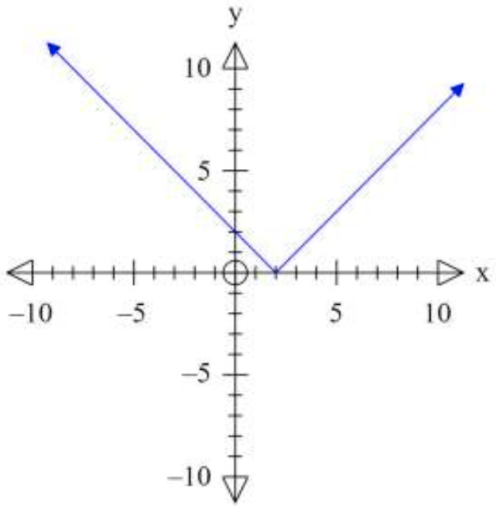


Sketch the graph of $y = f(x) + x^2$.

6. Solving and counting solutions graphically

Q27 2021 Moriah Prelim Q1 · **1 mark**

The curve shown has equation $y = |x - 2|$. By considering this graph and the graph of $y = 2x + 1$, how many solutions does the equation $|x - 2| = 2x + 1$ have?



(A) 0

(B) 1

(C) 2

(D) 3

Q28 2024 Sydney Girls Trial Q5 · **1 mark**

Using a graphical approach, what is the number of solutions to the equation $e^x + e^{-x} = x + 2$?

(A) 0

(B) 1

(C) 2

(D) 3

Q29 2023 Normanhurst Boys Trial Q4 · **1 mark**

How many solutions does the equation $x^{1/3} = |x - 2| - 3$ have?

(A) 0

(B) 1

(C) 2

(D) 3

Q30 2020 Blacktown Boys Prelim Q10 · **1 mark**

How many solutions does the equation $\sqrt{x} = |x - 1| - 1$ have?

(A) 0

(B) 1

(C) 2

(D) 3

Q31 2025 Sydney Girls Trial Q6 · **1 mark**

Using a graphical approach, how many solutions are there to $\ln|x| = \dfrac{1}{\ln x}$?

(A) 0

(B) 1

(C) 2

(D) 3

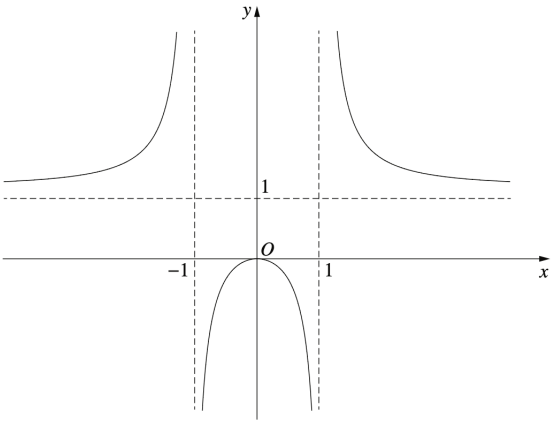
Q32 2020 James Ruse Prelim Q9(a)(iii) · **2 marks**

Consider the curve $y = \dfrac{8x}{x^2 + 20}$ and the horizontal line $y = k$. Show that for the line to intersect the curve, k must satisfy $-\dfrac{2}{\sqrt{5}} \leq k \leq \dfrac{2}{\sqrt{5}}$.

7. Identifying a function or transformation from its graph

Q33 2019 HSC Q4 · 1 mark

The diagram shows the graph of $y = f(x)$.



Which equation best describes the graph?

(A) $y = \dfrac{x}{x^2 - 1}$

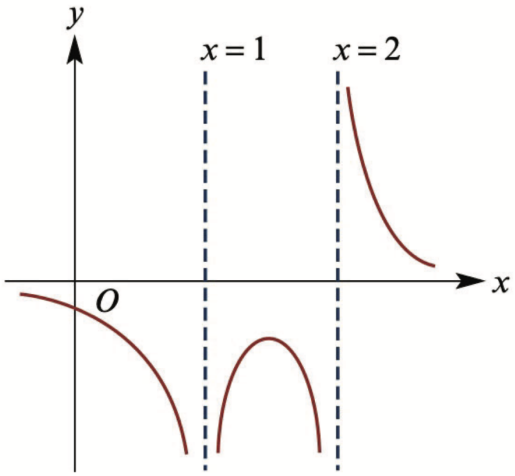
(B) $y = \dfrac{x^2}{x^2 - 1}$

(C) $y = \dfrac{x}{1 - x^2}$

(D) $y = \dfrac{x^2}{1 - x^2}$

Q34 2025 North Sydney Boys Trial Q1 · **1 mark**

Consider the graph shown. Which function does the graph represent?



(A) $y = \dfrac{1}{(x-1)(x-2)}$

(B) $y = \dfrac{x}{(x-1)(x-2)^2}$

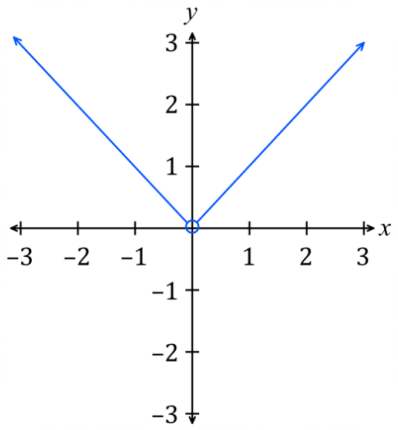
(C) $y = \dfrac{(x-1)(x-2)}{x}$

(D) $y = \dfrac{1}{(x-1)^2(x-2)}$

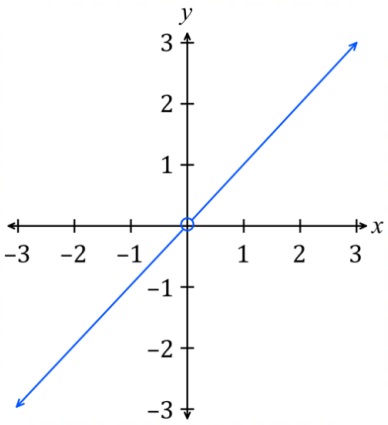
Q35 2022 Fort St Prelim Q1 · **1 mark**

Which of the following is the graph of $f(x) = \dfrac{|x|}{x}$ for $x \neq 0$? The four options are shown below.

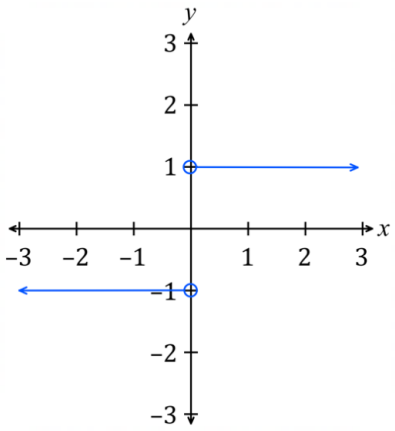
(A)



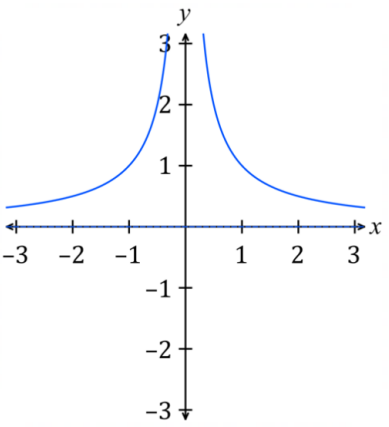
(B)



(C)

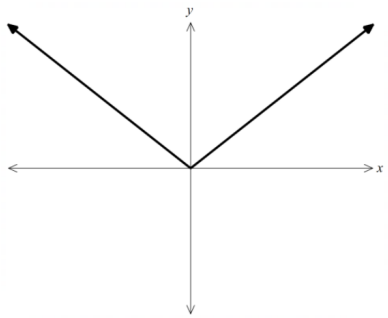


(D)



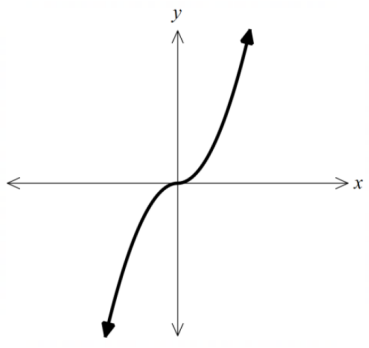
Q36 2023 Trinity Grammar Trial Q4 · **1 mark**

The diagram shows the graph of $y = |x|$. Which of the following could be a sketch of the graph of $y = x|x|$? The four options are shown below.

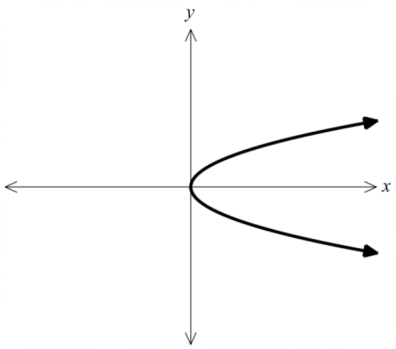


Which of the following could be a sketch of the graph of $y = x|x|$?

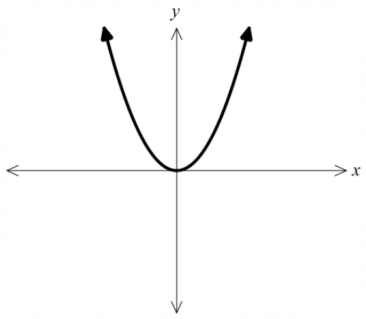
A.



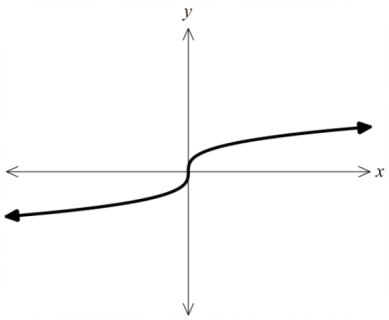
B.



C.



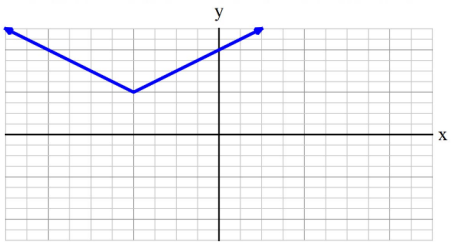
D.



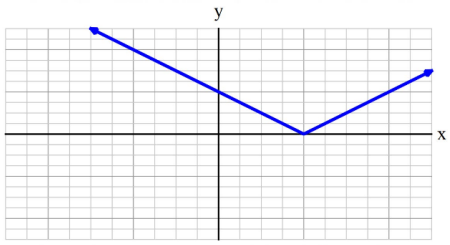
Q37 2025 Riverview Trial Q10 · **1 mark**

The graph of $y = |2 - x|$ is which of the following? The four options are shown below.

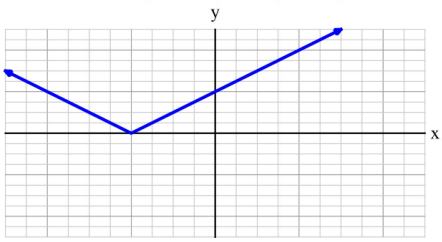
A



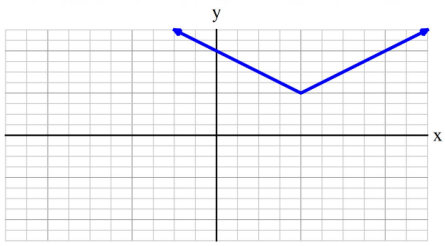
B



C

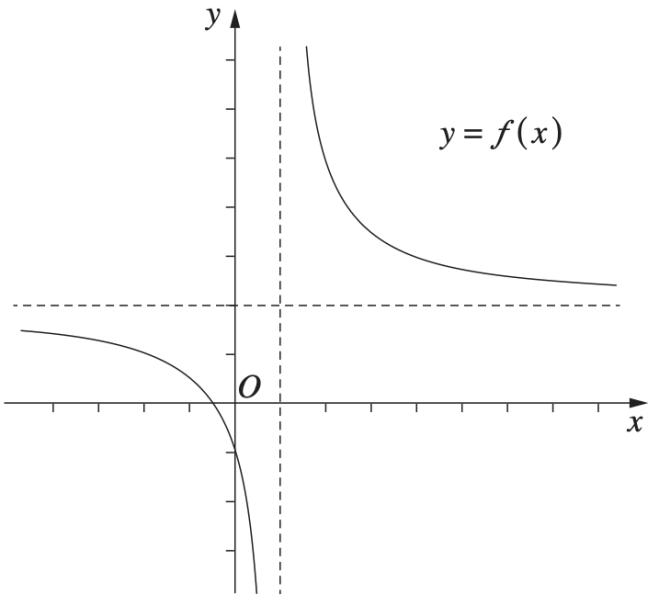


D

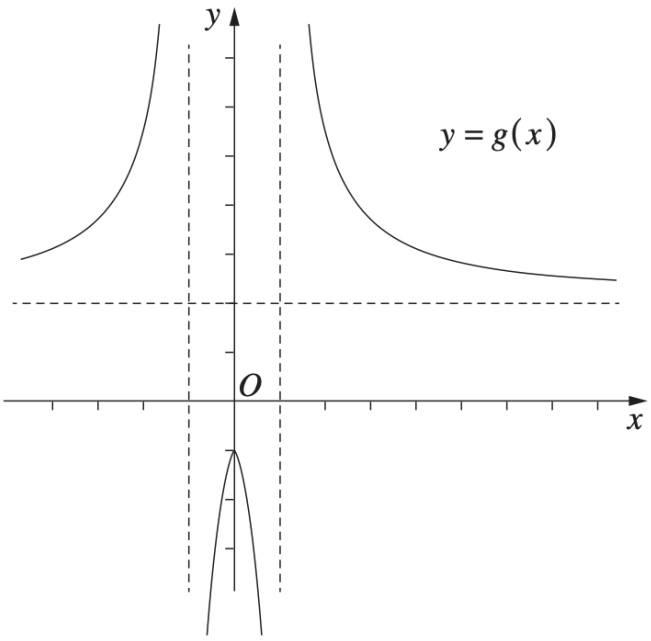


Q38 2022 HSC Q2 · **1 mark**

The graph of $f(x) = \dfrac{3}{x-1} + 2$ is shown, together with the graph of $y = g(x)$ obtained by transforming it.



The graph of $f(x)$ was transformed to get the graph of $g(x)$ as shown.



What transformation was applied?

(A) $g(x) = f(|x|)$

(B) $g(x) = |f(x)|$

(C) $g(x) = f(-x)$

(D) $g(x) = \dfrac{1}{f(x)}$