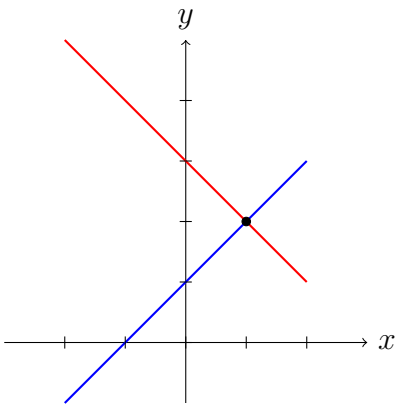
ILLAWARRA TUTORING

In this worksheet you will develop the skills to find the intersection points of graphs both algebraically and visually. Work through each question, showing all your steps, and use diagrams where indicated.

Easy Questions

1. Solve for the point of intersection of the lines $y = x + 2$ and $y = 2x - 1$.
2. Find the coordinates where the line $y = -x + 3$ intersects the line $y = 3x - 1$.
3. Determine the intersection of $y = x$ and $y = 2$ by solving algebraically.
4. Examine the diagram below and state the coordinates of the intersection point.

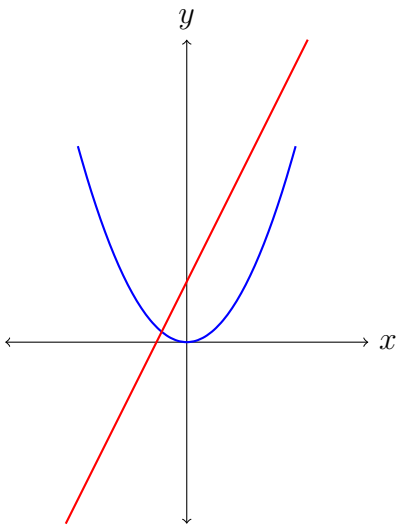


5. Find the intersection of $y = -2x + 6$ and $y = 4$ both algebraically and confirm your answer by sketching on pen and paper.

Intermediate Questions

6. Find the intersection points of $y = x + 1$ and $y = x^2 - 1$.
7. Determine the two points where $y = 2x$ and $y = x^2 + x$ intersect.
8. Calculate the intersection points of the quadratics $y = x^2 + 2x + 1$ and $y = 2x^2 + 3x + 1$.
9. Find the coordinates of intersection for $y = -x^2 + 4$ and $y = x^2 - 6$.
10. Solve for the intersection of $y = (x - 1)^2$ and $y = x + 1$.

11. Study the following diagram and estimate the intersection point of the line $y = 2x+1$ and the parabola $y = x^2$. Then, describe briefly how you would find this point algebraically.



12. Solve for the intersection points of $y = \frac{x}{2} + 1$ and $y = \frac{x^2}{2}$. (Hint: Multiply through by 2 to simplify the equation.)

13. Find all points where $y = x$ and $y = x^3$ intersect.

14. Determine the intersection points of $y = 3$ and $y = (x - 1)(x - 3)$. (Hint: Expand the product and set equal to 3.)

15. Find the intersection points of $y = x^2$ and $y = x + 2$.

16. Calculate the intersection point(s) of $y = x^2$ and $y = (x - 2)^2 + 1$.

17. Find the coordinates where $y = -x^2 + 4$ and $y = 2x - 1$ meet.

18. Solve for the intersection point of $y = x^2 + x$ and $y = x^2 - x + 2$.

19. Consider the graphs of $y = -x + 2$ and $y = x^2 - 2$. Sketch the graph on paper and estimate the intersection points. Then, verify these algebraically.

20. In a short paragraph, explain which method (algebraic or visual) might be more reliable for finding graph intersections and why. Include one advantage and one disadvantage of each method.

Hard Questions

21. Find all intersection points of $y = x^3$ and $y = x^2 + x$. (Hint: Rearrange to factor $x(x^2 - x - 1) = 0$.)

22. Determine the coordinates where $y = x^3$ and $y = x^2 + 2x$ intersect. (Hint: Factor the resulting polynomial.)

23. Calculate the intersection points of $y = x^3 - 4x$ and $y = 2x^2 - 8$. (Hint: Bring all terms to one side and factor by grouping.)

24. Solve for the intersection points of $y = 2x^3 - x + 1$ and $y = x^3 + x^2 - 1$. (Hint: Equate the expressions and simplify to a cubic equation.)

25. Find the intersection points of $y = x^3$ and $y = x^2 + 2$. (Hint: Rearrange to solve $x^3 - x^2 - 2 = 0$.)

26. Determine the solution set for $y = x^4 - 5x^2 + 4$ when it intersects the line $y = 0$. (Hint: Factor into quadratics.)

27. Find the unique intersection point of $y = x^2 - 2x + 1$ and $y = 2x - 3$.

28. Solve for the intersection points of $y = x^3 - x$ and $y = x^2 - 1$. (Hint: Factor the equation $x^3 - x^2 - x + 1 = 0$.)

29. In a brief essay, compare and contrast the algebraic and visual methods for finding intersections of graphs. Explain the importance of both methods in understanding function behaviour and provide a real-world example where each method might be preferable.