Linear and non-linear simultaneous equations: 10 practice questions

Year 10A · Free practice sheet from Tuterly · tuterly.com.au

Name: _____ Date: _____

Attempt all questions and show your working. Suggested time: 15 to 20 minutes.

Section A: Consolidating (Questions 1-4)

Question 1

Solve the simultaneous equations $y = 2x + 1$ and $3x + y = 11$.

Question 2

Solve the simultaneous equations $2x + 3y = 12$ and $4x - 3y = 6$.

Question 3

Show that the points (1, 2) and (2, 5) both lie on the parabola $y = x^2 + 1$ and on the line $y = 3x - 1$. What does this tell you about the two graphs?

Question 4

Solve $x^2 - 5x + 6 = 0$.

Section B: Standard (Questions 5-10)

Question 5

Find the points of intersection of $y = x^2$ and $y = x + 6$.

Question 6

Find the points of intersection of $y = x^2 - 4x + 3$ and $y = 2x - 5$.

Question 7

Find the points where the line $y = x + 1$ meets the circle $x^2 + y^2 = 25$.

Question 8

Find the points of intersection of the hyperbola $y = 6/x$ and the line $y = x + 1$.

Question 9

For each pair, form a quadratic equation and use the discriminant to decide how many times the graphs meet. If they meet at exactly one point, find it.

(a) $y = x^2 + 1$ and $y = 2x$

(b) $y = x^2 + 4$ and $y = x$

(c) $y = x^2$ and $y = 3x - 2$

Question 10

The graphs of $y = 2^x$ and $y = x + 3$ meet at a point where x is between 2 and 3. Use a calculator to guess, check and refine.

(a) Copy and complete the table, giving values correct to two decimal places.

x	2	3	2.4	2.5	2.45
2^x	☐	☐	☐	☐	☐
x + 3	☐	☐	☐	☐	☐

(b) For each value of x in the table, state which expression is larger.

(c) Use your table to give the x-value of the point of intersection correct to one decimal place. Explain how the table shows this.

Linear and non-linear simultaneous equations: answers

Year 10A · Free practice sheet from Tuterly · tuterly.com.au

Question 1

Answer: $x = 2$, $y = 5$

Question 2

Answer: $x = 3$, $y = 2$

Question 3

Answer: $1^2 + 1 = 2$ and $3(1) - 1 = 2$; $2^2 + 1 = 5$ and $3(2) - 1 = 5$. The line and parabola intersect at these two points.

Question 4

Answer: $x = 2$ or $x = 3$

Question 5

Answer: (3, 9) and (-2, 4) ($x^2 - x - 6 = 0$)

Question 6

Answer: (2, -1) and (4, 3) ($x^2 - 6x + 8 = 0$)

Question 7

Answer: (3, 4) and (-4, -3) ($2x^2 + 2x - 24 = 0$, so $x^2 + x - 12 = 0$)

Question 8

Answer: (2, 3) and (-3, -2) ($x^2 + x - 6 = 0$)

Question 9

Answer: (a) $x^2 - 2x + 1 = 0$, $\Delta = 0$: one point, (1, 2) (b) $x^2 - x + 4 = 0$, $\Delta = -15$: no points (c) $x^2 - 3x + 2 = 0$, $\Delta = 1$: two points

Question 10

Answer: (a) 2^x: 4, 8, 5.28, 5.66, 5.46. $x + 3$: 5, 6, 5.4, 5.5, 5.45 (b) $x + 3$ is larger at $x = 2$ and 2.4; 2^x is larger at $x = 3$, 2.5 and 2.45 (c) $x \approx 2.4$: the larger expression changes between 2.4 and 2.45, so the solution is between them and rounds to 2.4