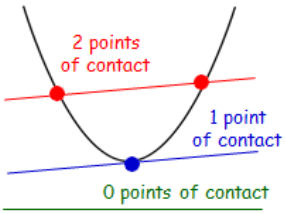
Outcome 1 – 2 points of contact



Bronze example

Example...

Find the coordinates of the points of intersection of the curve $y = x^2 + x - 12$ and the line $y = 4x - 2$.

1. Set them equal: $x^2 + x - 12 = 4x - 2$
2. Set = 0: $x^2 - 3x - 10 = 0$
3. Factorise: $(x - 5)(x + 2) = 0$
4. Solve: $x = 5 \quad x = -2$
5. Sub in to get y: $y = 20 - 2 = 18$, $y = -8 - 2 = -10$
6. Write coords: $(-2, -10) \quad (5, 18)$

Bronze questions

Calculate the points of intersection between the following curves and straight lines...

1. $y = x^2 - 5x + 9$ and $y = x + 4$
2. $y = x^2 + 7x - 2$ and $y = 5x + 1$
3. $y = x^2 + 12x + 52$ and $y = 4 - 2x$
4. $y = x^2 - 3x - 4$ and $y = 6$
5. $y = x^2$ and $y = 6x$
6. $y = 3x^2 + 17x - 7$ and $y = 6x - 3$

Outcome 2 – 1 point of contact

Silver example

Example...

Show that the line $y = 2x - 5$ is a tangent to the curve $y = x^2 - 6x + 11$ and find the coordinates of the point of contact.

1. Set them equal: $x^2 - 6x + 11 = 2x - 5$
2. Set = 0: $x^2 - 8x + 16 = 0$
3. Factorise: $(x - 4)(x - 4) = 0$
4. Solve: $x = 4$
5. Statement: Since only one point of contact, line is tangent.
6. Sub in to get y: $y = 8 - 5 = 3$
7. Write coords: $(4, 3)$

Silver questions

Show that the following lines are tangents to the curves and find the coordinates of the points of contacts...

1. $y = x^2 + 5x + 1$ and $y = x - 3$
2. $y = x^2 - 9x + 40$ and $y = 3x + 4$
3. $y = x^2 + 7x + 30$ and $y = 5 - 3x$
4. $y = x^2 - 8x + 7$ and $y = -9$
5. $y = x^2$ and $y = 2x - 1$
6. $y = 25x^2 + 5x + 7$ and $y = 15x + 6$

Outcome 3 – No points of contact

Gold example

Example...

Show that the line $y = 5x + 2$ does not intersect the parabola with equation $y = x^2 + 2x + 9$.

1. Set them equal: $x^2 + 2x + 9 = 5x + 2$
2. Set = 0: $x^2 - 3x + 7 = 0$
3. $b^2 - 4ac$: **This parabola does NOT factorise!**

$b^2 - 4ac = 9 - 4(7)$, $= 9 - 28 = -19$ with $a = 1$, $b = -3$, $c = 7$

4. THREE part statement! Since $b^2 - 4ac < 0$, there are no real roots, therefore the line does not intersect the parabola.

Gold questions

Show that the following lines do not intersect the given parabolas....

1. $y = x^2 - 3x + 8$ and $y = x - 2$
2. $y = x^2 + 2x + 5$ and $y = 3x - 10$
3. $y = x^2 - 5x + 11$ and $y = 2 - 3x$
4. $y = x^2 - 12x + 20$ and $y = -40$
5. $y = x^2$ and $y = x - 5$
6. $y = 2x^2 + x + 8$ and $y = 1 - 4x$

Bronze Answers

1. (1, 5) and (5, 9)
2. (-3, -14) and (1, 6)
3. (-6, 16) and (-8, 20)
4. (-2, 6) and (5, 6)
5. (0, 0) and (6, 36)
6. (-4, -27) and $(\frac{1}{3}, -1)$

Silver Answers

1. (-2, -5)
2. (6, 22)
3. (-5, 20)
4. (4, -9)
5. (1, 1)
6. $(\frac{1}{5}, 9)$

Gold Answers

1. $b^2 - 4ac = -31$
2. $b^2 - 4ac = -39$
3. $b^2 - 4ac = -3$
4. $b^2 - 4ac = -220$
5. $b^2 - 4ac = -27$
6. $b^2 - 4ac = -23$