

Parabola Quiz (No Calculator)

Level 1 – 2

1. Write down the coordinates of the vertex of the following parabolas:

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

b) $y = 3(x - 1)^2 + 4$

c) $y = -(x + 3)^2 - 5$

d) $y = 4(x - 6)^2 + 2$

e) $y = 2x^2 + 3$

f) $y = -2(x - 4)^2$

2. Determine the equation of the axis of symmetry for the following parabolas:

a) $y = x^2 - 4x + 1$

b) $y = 2x^2 + 8x - 3$

c) $y = 3x^2 - 3x + 2$

3. Determine the coordinates of the x -intercepts for the following parabolas:

a) $y = (x + 3)(x - 2)$

b) $y = 3(x - 1)(x + 4)$

c) $y = -(x + 2)(x - 5)$

d) $y = x(x - 2)$

4. Determine the coordinates of the y -intercept for the following parabolas:

a) $y = x^2 + 3x + 2$

b) $y = x^2 - 4x - 1$

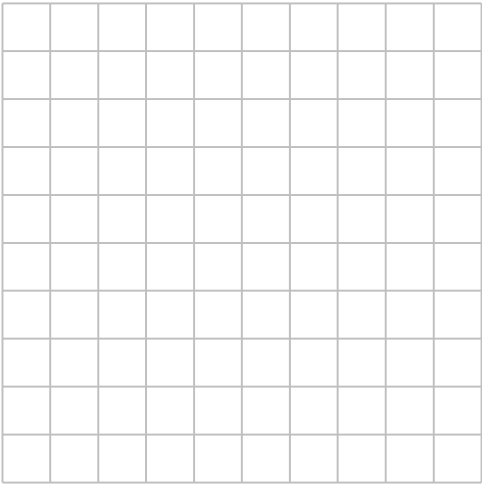
c) $y = 3x^2 - x + 5$

d) $y = -x^2 - x$

5. For each of the following parabolas

- i) determine the coordinates of the y -intercept
- ii) determine the coordinates of the x -intercepts
- iii) determine the coordinates of the vertex
- iv) determine the equation of the axis of symmetry
- v) sketch the parabola, make sure you include **all** of the information from parts i) to iv)

a) $y = x^2 + 6x - 16$



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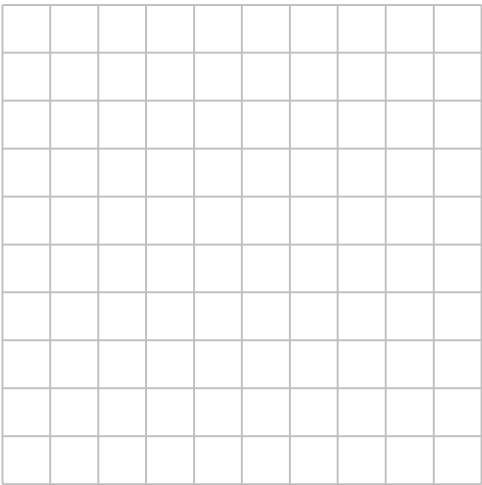
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i) ii) iii) iv)

b) $y = x^2 - 8x - 20$



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i) ii) iii) iv)

Level 5 – 6

6. Paul thinks of a number, multiplies it by 6, subtracts the square of the original number, and adds 3. Determine the maximum possible value of the result and the original number which produces this result.

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7. A parabola passes through the points $(-7, -9)$, $(-5, 7)$ and $(3, -9)$.

a) If the equation of the parabola is written in the form $y = a(x - p)^2 + q$ explain why the value of p must be -2 .

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b) Determine the values of a and q .

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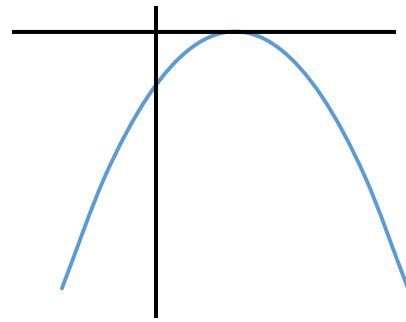
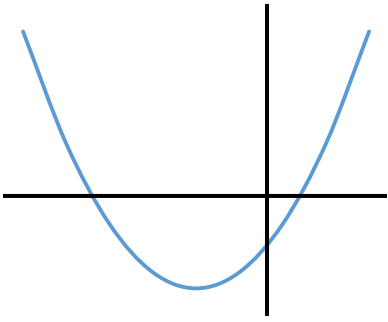
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8. For each of the following parabolas, what can you say about the discriminant of the equation of the parabola. Give a reason for each answer.



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Level 7 – 8

9. A ball is thrown vertically into the air. Its height h in metres after t seconds is given by the equation $h(t) = 30t - 5t^2$. Determine the maximum height of the ball and the time when this occurs.

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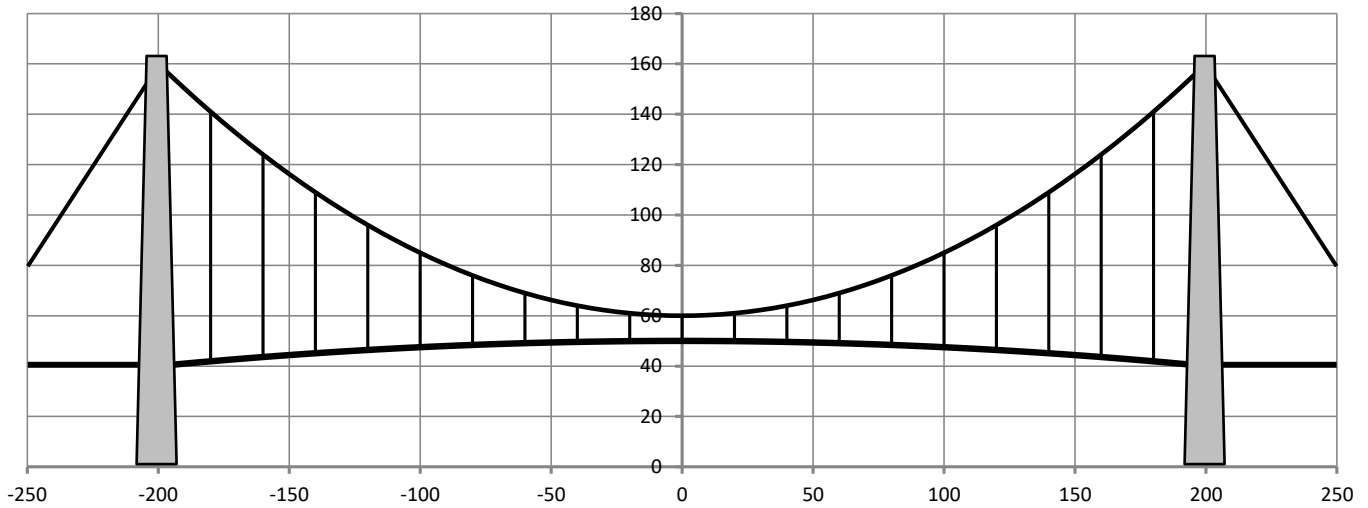
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10. A bridge with a main span of 400m is built across a river. Both the road and the main supporting cable are parabolas. The road starts at a height of 40 m and reaches its highest point in the centre when it is 50 m above the river. The supporting cable starts at a height of 160 m and reaches its lowest point in the centre when it is 60 m above the water.



a) Determine the quadratic equation which describes the road.

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b) Determine the quadratic equation which describes the supporting cable.

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c) A railway track is to be built exactly five metres below the road. Write down the quadratic equation which describes the track.

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d) Calculate the length of the vertical cable which lies on the line $x = -100$.

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11. The two parabolas $y = kx^2 - 2x + k$ and $y = x^2 - kx + 1$ do not intersect. Determine the restrictions on the value of k .

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