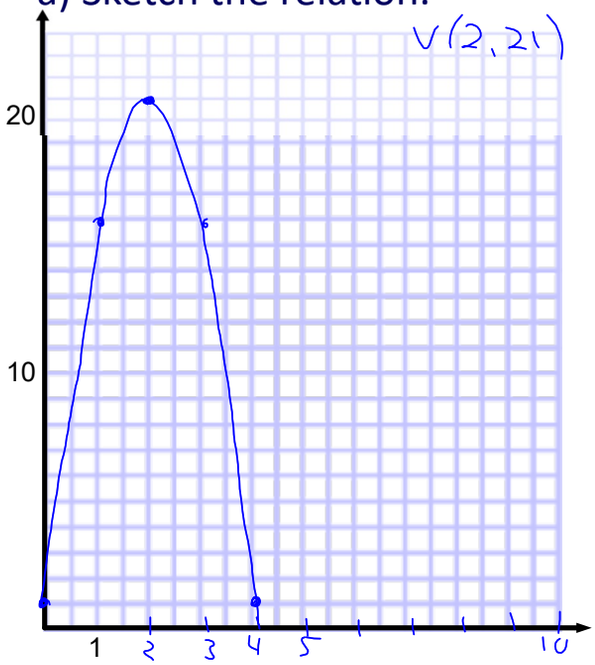
3.5 Applications: Vertex Form

Ex 1: A video tracking device recorded the height, h, in metres, of a baseball after it was hit. The data collected can be modelled by the relation: $h = -5(t-2)^2 + 21$, where t is the time in seconds after the ball was hit.

a) Sketch the relation.



b) What was the maximum height of the ball? 21 m

c) When did the maximum height occur? at $t = 2$ s

d) From what height was the ball hit?

1 m

e) How high was the ball after 1 s? Determine another time when the ball was this height.

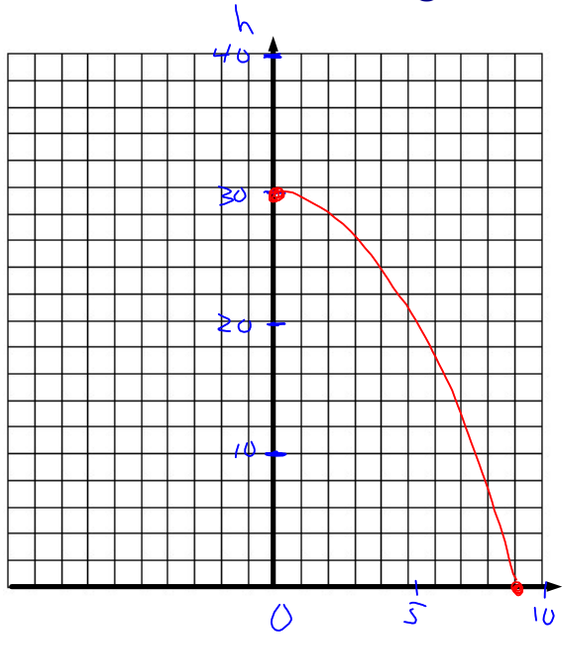
16 m high

also 16 m @ $t = 3$ s

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Ex. 2: Sketch the parabola, then determine its equation. Algebraically determine the value of 'a'.

The parabola starts at the highest point of 30 m. It drops to zero 9 metres to the right of the highest point.



V (0, 30)
x-int (9, 0)

① Build using what we know. Use placeholder for unknown.

② Sub in any other point from graph to solve

V(0,30) & (9,0)

① $y = a(x-0)^2 + 30$

$y = ax^2 + 30$

② $0 = a(9)^2 + 30$

$-30 = 81a$

$\frac{-30}{81} = a$

$\frac{-10}{27} = a$

$\therefore y = -\frac{10}{27}x^2 + 30$

Ex 3: Find the equation of a parabola that has:

a) vertex at (-2,5) and goes through (1,-3)

$y = a(x-h)^2 + k$

$y = a(x+2)^2 + 5$

Sub in $(1,-3)$

$-3 = a(1+2)^2 + 5$

$-3 = a(3)^2 + 5$

$-8 = 9a$

$-\frac{8}{9} = a$

$\therefore y = -\frac{8}{9}(x+2)^2 + 5$

b) stretch factor of 2, reflected about the x-axis, equation of the axis of symmetry x = 3 and goes through the point (2,5)

$a = -2$ $V(3, ?)$ ← use k

$y = a(x-h)^2 + k$

$y = -2(x-3)^2 + k$

Sub in $(2,5)$

$5 = -2(2-3)^2 + k$

$5 = -2(-1)^2 + k$

$5 = -2(1) + k$

$5 = -2 + k$

$7 = k$

$\therefore y = -2(x-3)^2 + 7$

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