1. A math teacher has a son, Dennis, who plays little league baseball and came up with a great idea for a problem while watching a game last Saturday. She modelled an equation based off of one of Dennis's hits:

$$h(t) = 3t^2 + 16.3t + 1.5,\ t \geq 0$$

Where h is the height of the ball in meters, t is the length of time in seconds, and $t = 0$ represents the moment Dennis hit the ball.

(a) What is the height, off the ground, from which the ball is hit? (1 mark)

(b) Find the height of the ball after 3 seconds (2 marks)

(c) The ball lands after p seconds, find p (2 marks)

(d) Find $h'(t)$ (2 marks)

(e) (i) When is the ball at its maximum height? (2 marks)

(ii) Find the maximum height of the ball. (2 marks)

Mark scheme:

(a) 1.5 m (A1)

(b) $t = 3$
$h(3) = -3(3)^2 + 16.3(3) + 1.5$ (M1)
$h(3) = 23.4$ m (A1)

(c) Solving for t using the calculator, quadratic formula, etc (M1)
$t = 5.52$ seconds (A1)

(d) $h'(t) = -6x + 16.3$ (A1)(A1)

(e) (i) $0 = -6x + 16.3$ (M1) ft Setting their derivative = 0

$x = 2.72$ seconds (A1) ft

(ii) $h(2.72) = -3(2.72) + 16.3(2.72) + 1.5$ (M1) ft Plugging in their (e)(i) value
$h(2.72) = 23.6$ m (A1) ft