Modelling with Quadratics – www.m4ths.com – Steve Blades ©

(1) The first part of a rollercoaster ride can be modelled by the equation $H = 2t^2 - 18t + 53$ where H is the height in metres the front car is above the ground after t seconds.
(a) State the starting height of the front car of the rollercoaster.
(b) Show that the front car doesn't car into the ground.
(c) Find the least height above the ground the front car ever reaches.
(d) Find the time it takes to reach this point
(e) How long was the front car at least 20 metres above the ground? Give you answer to 3 SF
(f) Comment on the long-term validity of the model.
(g) Sketch the graph of the motion of the front car.

(2) Boris is designing the new logo for ∩cDonalds. The 'golden arch' is to be made using a 3D printer ready to the erected outside the new restaurant. The equation on the printer of the arch is $Y = -4x^2 + 12x$ where Y is the vertical height in metres of the logo off the floor and x is the horizontal width of the arch in metres. The arch looks something like this:

(a) Find the height of the arch.
(b) Find the maximum width of the arch. You can presume the arch is made of wire and has no thickness.