Name: _____ **Show work needed to justify your answer.** Date: _____

HW: # 13a: Math IBSL - Standard 13 - Applications of Quadratics 5 points

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2 The height of a ball t seconds after it is thrown is modelled by the function $h(t) = 2 + 20t - 4.9t^2$, where h is the height of the ball in metres.

a Find the height of the ball 3 seconds after it is thrown.

b Find the times at which the ball has a height of 6 m.

c Find the maximum height of the ball.

a) $h(3) = 2 + 20(3) - 4.9(3)^2$

$= 2 + 60 - 4.9(9)$

$h(3) = 17.9$ m

b) $2 + 20t - 4.9t^2 = 6$

$4.9t^2 - 20t + 4 = 0$

$x = \frac{20 \pm \sqrt{400 - 4(4.9)(4)}}{2(4.9)}$

$x \approx 3.87$ or $x \approx 0.211$

c) $x = \frac{-b}{2a} = \frac{-20}{2(-4.9)} \approx 2.04$

$h(2.04) = 2 + 20(2.04) - 4.9(2.04)^2$

max Height ≈ 22.4 meters

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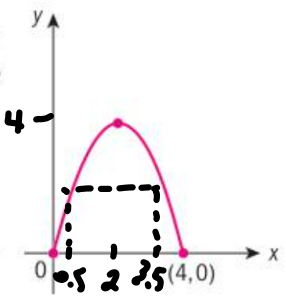
4 The shape of an archway is modelled by the graph of a quadratic function. The maximum height of the archway is 4 m and the maximum width is 4 m. The graph shows a model of the archway.

a Find a function to model the archway.

b Use the function to determine whether an object 3 m wide and 1.6 m tall will fit through the archway.



a) Vertex: (2,4)

$f(x) = a(x-2)^2 + 4$

$0 = a(4-2)^2 + 4$

$0 = 4a + 4$

$a = -1$

VERTEX $f(x) = -(x-2)^2 + 4$

OR $f(x) = a(x-0)(x-4)$

$4 = a(2-0)(2-4)$

$4 = -4a$

$a = -1$

INTERCEPT $f(x) = -(x-0)(x-4)$

OR $f(x) = -x^2 + 4x$ STANDARD

(b) $f(0.5) = -(0.5)^2 + 4(0.5)$

$f(0.5) = -.25 + 2$

$f(0.5) = 1.75$ m

Truck will fit. There is 1.75 m in height which is enough to fit 1.6 m high Truck.