

$$1. f(x) = -.5t^2 + 2t + 38$$

$$x = \frac{-b}{2a} = \frac{-2}{2(-.5)} = \boxed{2} \quad x\text{-value of vertex}$$

Plug it into the eqn to find the y-value.

$$y = -.5(2)^2 + 2(2) + 38$$
$$-2 + 4 + 38$$
$$40$$

$(2, 40)$  max. point

The missile is at a max height of 40 km  
at 2 minutes

$$2. h(t) = -4.9t^2 + 12t + 1.6$$

$$x = \frac{-b}{2a} = \frac{-12}{2(-4.9)} = 1.22 \text{ sec}$$

$$-4.9(1.22)^2 + 12(1.22) + 1.6$$

$$8.71$$

The max height is 8.71 meters at 1.22 sec.

$$3. y = -.04x^2 + .88x$$

$$\frac{-b}{2a} = \frac{-.88}{2(-.04)} = 11$$

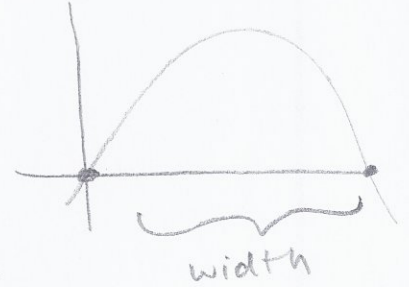
$$-.04(11)^2 + .88(11)$$

$$4.84$$

The height of the tunnel is 4.84 meters

To find the width of the tunnel, find the x-intercepts.

$$\begin{aligned}\text{Set } y=0 \quad & -0.04x^2 + 0.88x = 0 \\ & -x(-0.04x + 0.88) = 0 \\ & -x = 0 \quad -0.04x + 0.88 = 0 \\ & \boxed{x=0} \quad -0.04x = -0.88\end{aligned}$$



$$22 - 0 = \boxed{22}$$

$$\boxed{x=22}$$

The width of the tunnel is 22 meters

$$\textcircled{4} \quad y = -\frac{1}{2}x^2 + 4x$$

$$\frac{-b}{2a} = \frac{-4}{2(-\frac{1}{2})} = 4$$

$$y = -\frac{1}{2}(4)^2 + 4(4)$$

$$y = 8$$

Set  $y=0$  to find x-intercepts

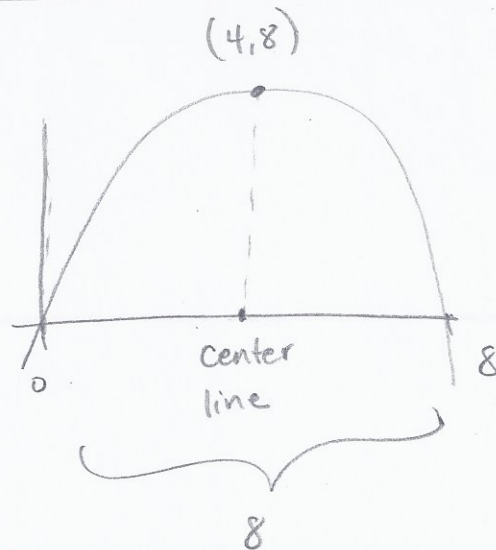
$$-\frac{1}{2}x^2 + 4x = 0$$

$$x(-\frac{1}{2}x + 4) = 0$$

$$x = 0 \quad -\frac{1}{2}x + 4 = 0$$

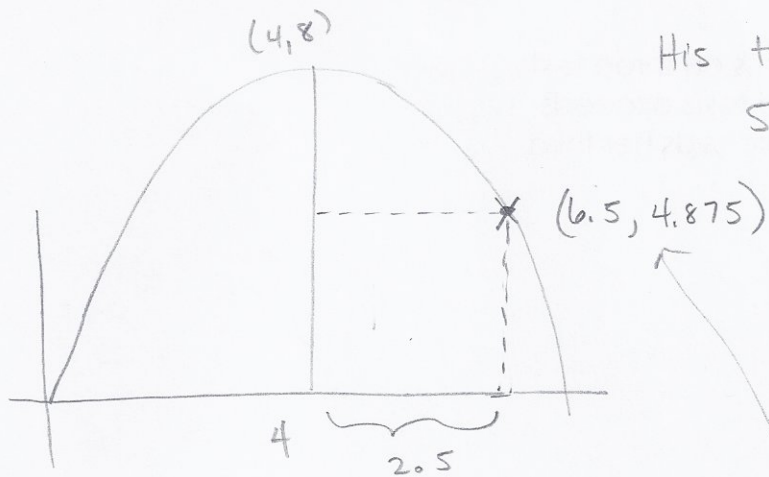
$$-\frac{1}{2}x = -4$$

$$x = 8$$



So the width of the tunnel is 8 meters

Hmmm.... does the truck fit?



His truck is 2.5 m wide +  
5 m tall.

$$4 + 2.5 = 6.5$$

So, my  $x = 6.5$ , now I need to find the height at that point. Plug it back in the original equation.

$$y = -\frac{1}{2}(6.5)^2 + 4(6.5)$$

$$y = 4.875 \text{ m}$$

If needs to be  $> 5$  m tall, so it looks like this is his last day on the job.