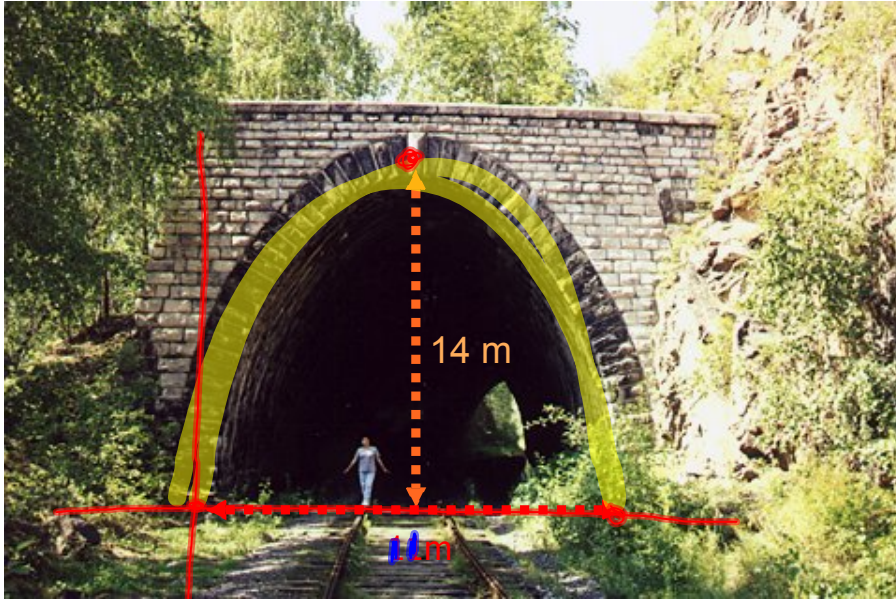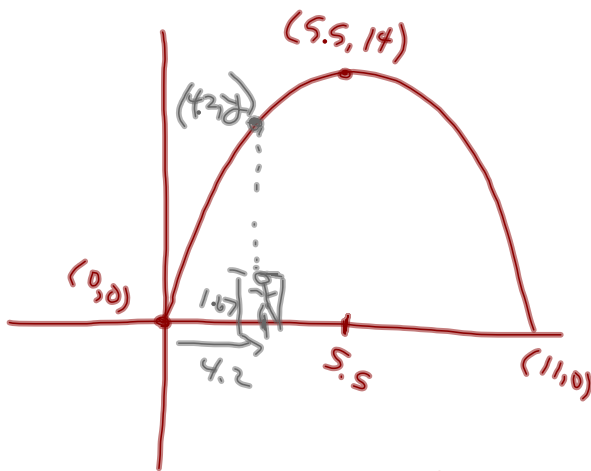The young lady you can see in this photo is 1.67m tall. If she is situated 4.2 m from the edge of this parabolic train tunnel, how far is it from the top of her head up to the tunnel?

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

$$0 = a(0-5.5)^2 + 14$$

$$\frac{-14}{(5.5)^2} = a$$

$$y = \frac{-14}{30.25}(x-5.5)^2 + 14$$

$$y = \frac{-14}{30.25}(4.2-5.5)^2 + 14$$

$$y = 13.2\,m$$

∴ head clearance: $13.2 - 1.67$

$$= 11.53m$$

Quiz:

M/ch.

#2/ $y = \widehat{ax}^{2} \widehat{+b}$ $b > 0$ $a < 0$
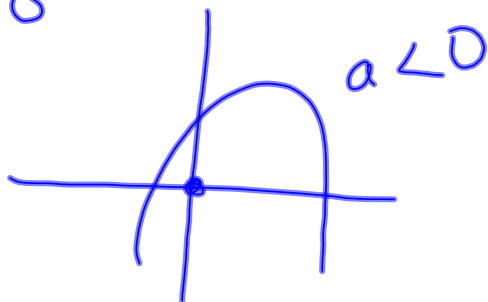
#3) $f(x) = 1(x-4)^2 + 8$ $g(x) = 1(x+4)^2 + 5$

$V(4,8)$ → $V(-4,5)$

8 left
Down 3

2

#2) $(x, y) \Rightarrow (x + 5w, \; ry - 3q)$

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

$$y = 2r(x - 5w)^2 - 3q$$

$$y = ax^2 + bx + c$$

$$y = 2r(x^2 - 10wx + 25w^2) - 3q$$

$$y = 2r x^2 - 20rwx + 50rw^2 - 3q$$

$a = 2r \quad b = -20rw \quad c = 50rw^2 - 3q$

4.b) $y = -\frac{2}{3}\left(x^2 - 9x + \frac{81}{4}\right) - 5 + \frac{27}{2}$

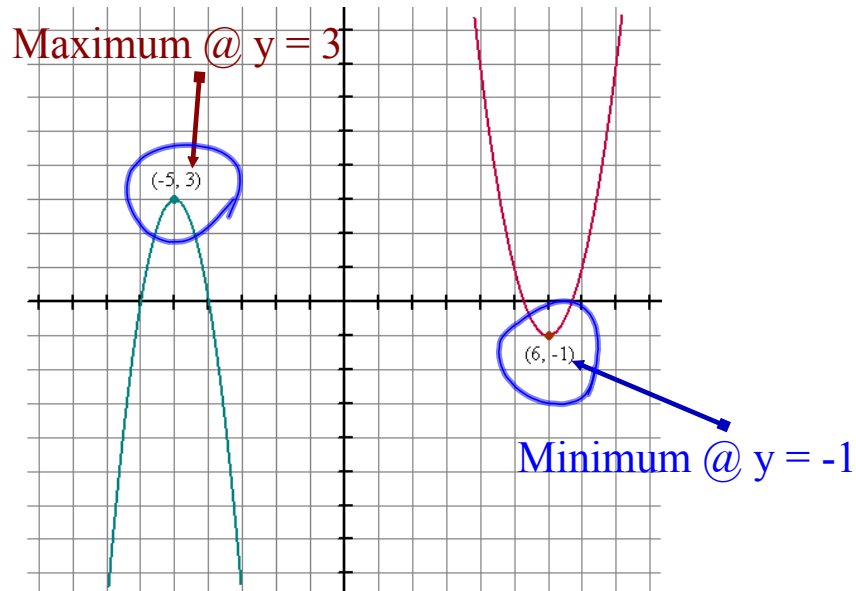$ y = -\frac{2}{3}\left(x - \frac{9}{2}\right)^2 + \frac{17}{2}$

$ V\left(\frac{9}{2}, \frac{17}{2}\right)$

$^3 6x^0 - \frac{3}{2}$

$\frac{27}{\cancel{81}} \cdot \frac{-\cancel{2}}{3} = -\frac{27}{2}$

Maxima and Minima

Maximum - the parabola opens downward and has a maximum *y-value*.
Minimum - the parabola opens upward and has a minimum *y-value*.

Maximum @ y = 3

(-5, 3)

(6, -1)

Minimum @ y = -1

- In order to find the maximum/minimum *y*-value, you must know the vertex.
- To identify the vertex, the quadratic equation must be in standard form.
- To put an equation in general form into standard form, you must **complete the square!**

EXAMPLE: Determine the maximum/minimum height given...

$$h(t) = 1 + 3t - 2t^2$$

$$h(t) = -2t^2 + 3t + 1$$

$$h(t) = -2\left(t^2 - \frac{3}{2}t + \frac{9}{16}\right) + 1 + \frac{9}{8}$$

$$h(t) = -2\left(t - \frac{3}{4}\right)^2 + \frac{17}{8}$$

$$V\left(\frac{3}{4}, \frac{17}{8}\right)$$

$h(t) \rightarrow$ height "m"
$t \rightarrow$ time "sec"

Max. Height : $\frac{17}{8}$ m
(Opens Down)

Example 2: A ball is thrown in the air and it's height, h, in metres at any time, t, in seconds is given by the function...

$$h(t) = -4.9t^2 + 14.7t + 3$$

a) Find the maximum height reached by the ball.

b) How long will it take for the ball to reach the max height?

c) How high was the ball when it was initially thrown? $t = 0$

d) How long was the ball in the air?

a) $h(t) = -4.9\left(t^2 - 3t + \frac{9}{4}\right) + 3 + \frac{9}{4}(4.9)$

$h(t) = -4.9\left(t - \frac{3}{2}\right)^2 + 14.025$

$V\left(\frac{3}{2}, 14.025\right)$

__Max. Height =__

__14.025m__

(b) After 1.5 seconds

(c) Let $t = 0$

$h = 0 + 0 + 3$

$h = 3m$

(d) After 3 seconds, back to start height (3m)

∴ In the air just over 3 sec.
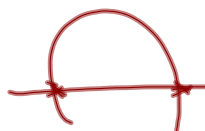
ground: $(h = 0)$

$0 = -4.9t^2 + 14.7t + 3$

$y = 0$

$0 = -4.9\left(t - \frac{3}{2}\right)^2 + 14.025$

$\dfrac{-14.025}{-4.9} = \dfrac{-4.9\left(t - \frac{3}{2}\right)^2}{-4.9}$
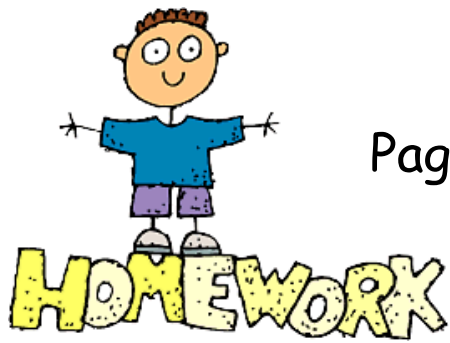
$\sqrt{9} = \pm 3$

$\sqrt{\dfrac{14.025}{4.9}} = \sqrt{\left(t - \frac{3}{2}\right)^2}$

$\pm\sqrt{\dfrac{14.025}{4.9}} = t - \frac{3}{2}$

$\frac{3}{2} \pm \sqrt{\dfrac{14.025}{4.9}} = t$

6

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Last Night's

SOLUTIONS

Text Solns_p. 38 Ques. 36 - 45.doc

Attachments

Text Solns_p. 38 Ques. 36 - 45.doc