

Activity

Real World Quadratic Applications

created for you by MS. Nihorsoubanin

1. Ahad is in a car at the top of a roller-coaster ride. The distance, d , of the car from the ground as the car descends is determined by the equation $d = 144 - 16t^2$, where t is the number of seconds it takes the car to travel down to each point on the ride. How many seconds will it take Ahad to reach the ground?

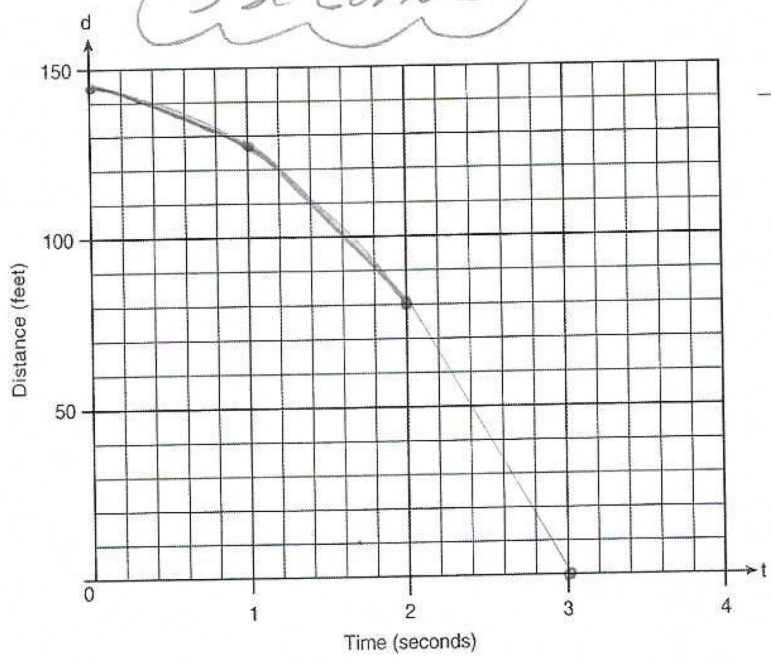
$$d = 144 - 16t^2 \rightarrow \text{set } = 0$$

$$0 = 144 - 16t^2 \text{ factor gcf}$$

$$0 = -16(9 - t^2)$$

$$0 \neq -16 \quad \begin{array}{l} \text{DOTS} \\ (3-t)(3+t) = 0 \\ 3=t \quad t=3 \\ \text{reject} \\ \text{no neg.} \\ \text{time} \end{array}$$

3 seconds



t	d
0	144
1	128
2	80
3	0

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Glue on page 36

2. If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height h after t seconds is given by the equation $h(t) = -16t^2 + 128t$ (if air resistance is neglected).

a. How long will it take for the rocket to return to the ground?

$$h(t) = -16t^2 + 128t$$

$$0 = -16t^2 + 128t$$

$$0 = -16t(t - 8)$$

$$\frac{0 = -16t}{-16} \quad | \quad t = 8$$

$$t = 0$$

It will take 8 seconds for the rocket to return to the ground

x	y
0	0
1	112
2	192
3	240
4	256
5	240
6	192
7	112
8	0

b. After how many seconds will the rocket be 112 feet above the ground? at 1 sec & 7 sec

c. How long will it take the rocket to hit its maximum height?

$$x = \frac{-b}{2a}$$

$$x = \frac{-(128)}{2(-16)}$$

$$x = 4$$

4 seconds

d. What is the maximum height?

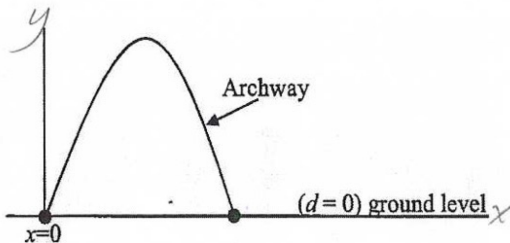
$$h(4) = -16(4)^2 + 128(4)$$

$$= -16(16) + 512$$

$$= -256 + 512$$

$$= 256 \text{ ft}$$

3. The entrance to an athletic field is in the shape of a parabolic archway. The archway is modeled by the equation $d = 12x - x^2$, where d represents the distance, in feet, that the arch is above the ground for any x value.



a) How many feet wide is the base of the arch? 12 ft

$$d = 12x - x^2$$

$$0 = x(12 - x)$$

$$0 = x \quad | \quad 12 - x = 0$$

$$\quad \quad \quad +x \quad +x$$

$$\quad \quad \quad \hline \quad \quad \quad 12 = x$$

$$\quad \quad \quad \uparrow$$

$$\quad \quad \quad 12 \text{ ft}$$

b) For what values of x will the arch be 20 feet above ground?

$$20 = 12x - x^2$$

$$\quad \quad \quad \uparrow \quad \quad \quad \uparrow$$

$$\quad \quad \quad -12x \quad + x^2$$

$$\hline x^2 - 12x + 20 = 0$$

$$(x - 10)(x - 2) = 0$$

$$x = 10 \quad | \quad x = 2$$

$$\text{at } 2 \text{ sec \& } 10 \text{ sec}$$

c.) What is the maximum height of the arch above the ground? 36 ft

$$x = \frac{-b}{2a}$$

$$x = \frac{-12}{2(-1)}$$

$$x = 6$$

$$h(6) = 12x - x^2$$

$$= 12(6) - (6)^2$$

$$= 36$$

$$\text{max. height}$$

x	y
0	0
1	11
2	20
3	27
4	32
5	35
6	36
7	35