DAY 4 - Application in Real Life – STANDARD form

1.

A homemade solar oven makes use of a parabola to reflect the sun's rays through its vertex. The solar oven can actually cook food. Its shape can be modelled by the equation $y = -2x^2 - 4x + 30$

a) Factor the equation and find zeros

$-2\left(\frac{-2x^2}{-2} - \frac{4x}{-2} + \frac{30}{-2}\right)$

$= -2(x^2 + 2x - 15)$

$= -2(x-3)(x+5)$

$-1 \quad -3 \quad 1 \quad 3$
$15 \quad 5 \quad 15 \quad -5$

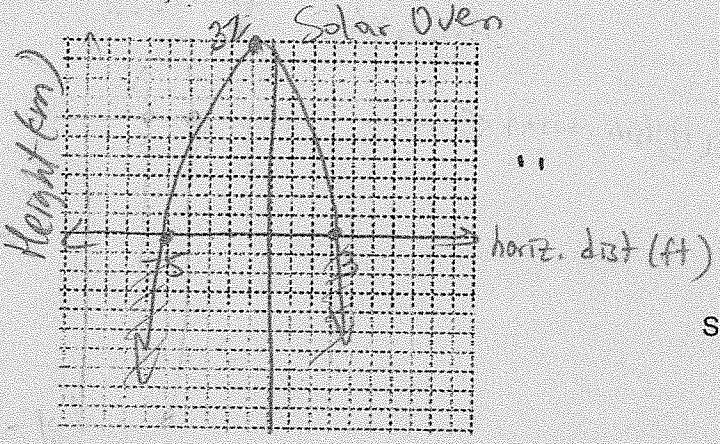
∴ zeros (3, 0) (−5, 0)

b) Fill in table using zeros and middle point

x	y
3	0
−1	$-2(-1)^2-4(-1)+30 = -2+4+30 = 32$
−5	

$\frac{-5+3}{2}$

Sketch - label key values



c) Let x represent horizontal distance in feet and y represent height in centimeters. What is the maximum height?

32cm

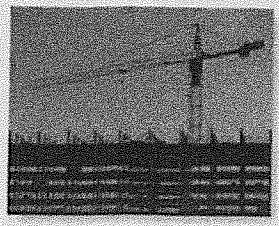
d) How wide is the solar oven at its base?

8 ft.

8

2.

The minimum cost of maintaining an overhead crane depends on the number of hours the crane is in operation. The cost is given by the relation $C = 2t^2 - 36t + 154$, where C represents the cost in hundreds of dollars and t represents the time in hours that the crane has been operated.



a) Factor the equation and find zeros

$C = 2\left(\frac{2t^2}{2} - \frac{36t}{2} + \frac{154}{2}\right)$

$= 2(t^2 - 18t + 77)$

$= 2(t-7)(t-11)$

$1 \quad -7$
$77 \quad -11$

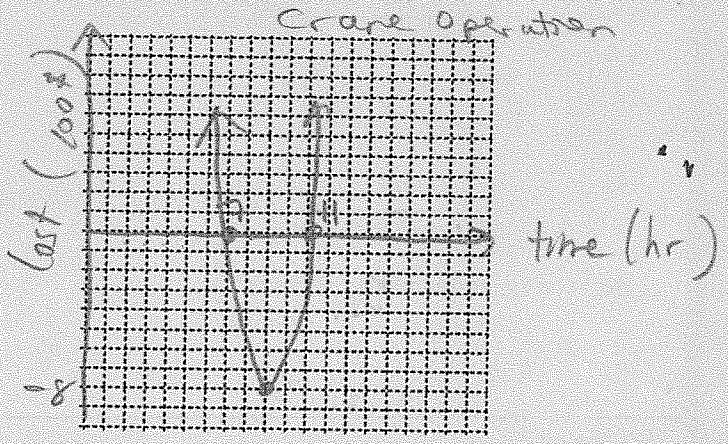
$t - 7 = 0 \quad t = 7$

$t - 11 = 0 \quad t = 11$

b) Fill in table using zeros and middle point

t	C
7	0
9	$2(9)^2-36(9)+154 = 2(81)-324+154 = -8$
11	0

Sketch - label key values



c) What is the minimum cost of maintaining the crane?

$800

d) What number of hours does the crane need to operate for this minimum cost?

9 hrs

e) What is the cost if the crane sits idle? (ie. t=0)

$2(0)^2 - 36(0) + 154$

$= \$15400$.

10

18

3. A model rocket is launched from a platform. Its flight path can be represented by the relation $h = -5t^2 + 100t + 220$, where h represents the height of the rocket in metres and t represents time in seconds.

a) Factor to find the zeros

$h = -5(t^2 - 20t - 44)$

$h = -5(t+2)(t-22)$

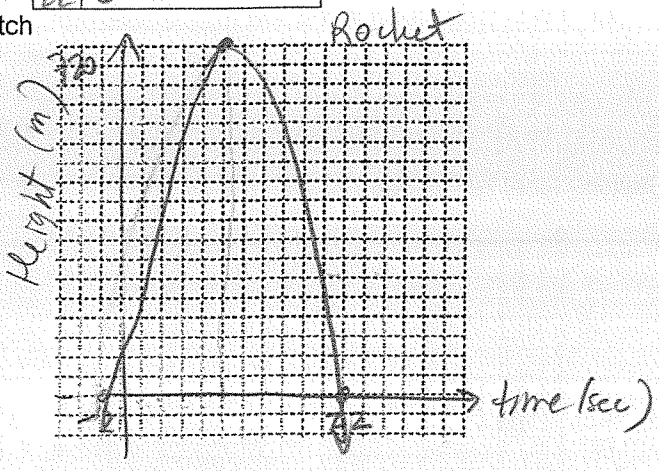
$t+2=0 \quad t-22=0$

$t=-2 \quad t=22$

b) Fill in table using zeros and middle point

t	h
-2	0
10	$-5(10)^2+100(10)+220 = -5(100)+1000+220 = 720$
22	0

Sketch



c) What is the height of the platform?

sub $t=0$

220 m

d) What is the maximum height?

720 m

e) How long is the rocket in the air?

22 sec

f) How high is the rocket at 10 sec?

$-5(10)^2+100(10)+220$

$-5(100)+1000+220$

720 m

4. Find the zeros from standard form – FACTOR first

a) $y = x^2 - 5x + 4$

$y=(x-1)(x-4)$

$x-1=0 \quad x-4=0$

$x=1 \quad x=4$

b) $y = 2x^2 - 4x - 30$

$y = 2(x^2 - 2x - 15)$

$y = 2(x+3)(x-5)$

$x+3=0 \quad x-5=0$

$x=-3 \quad x=5$

c) $y = -5x^2 + 25x$

$y = -5x(x-5)$

$-5x=0 \quad x-5=0$

$x=0 \quad x=5$

d) $y = x^2 - 64$

$(x+8)(x-8)$

$x+8=0 \quad x-8=0$

$x=-8 \quad x=8$

5. Identify what form each parabola is in and what is characteristic that can easily be seen from that form

a. $y = 3x + 5 - x^2$

Standard form

∴ see y-int = (0,5)

b. $y = 2(x+4)(x-9)$

Factored Form

∴ see zeros

$x+4=0 \quad x-9=0$

$x=-4 \quad x=9$

c. $y = -3(x+4)^2 + 1$

Vertex form

∴ see vertex

$=(-4,1)$

d. $y = 2x^2 - 5$

Standard $y = 2x^2 + 0x - 5$

or

vertex $y = 2(x-0)^2 - 5$

∴ see y-int = vertex

$=(0,-5)$