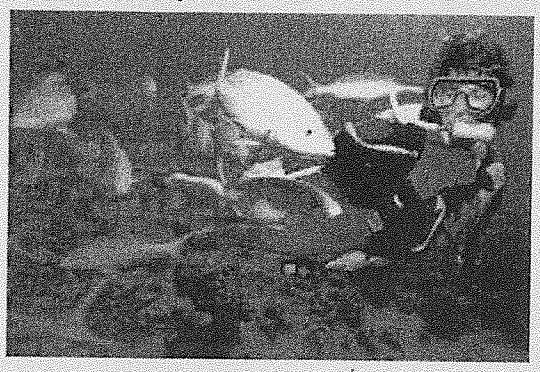
DAY ~~3~~ 4 - Application in Real Life – VERTEX form

1.
A scuba diver starts her ascent to the surface of the water. The equation that models her ascent is $d = 2.5t^2 - 250$, where d is the depth in feet below the surface of the water and t the time in seconds taken to get to the surface.

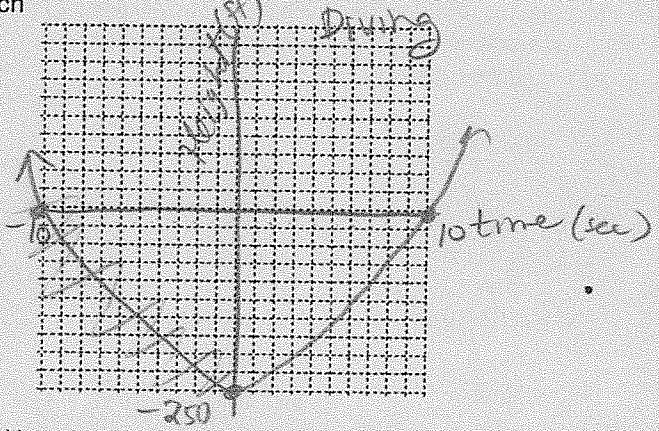


a) What is the vertex? $d = 2.5(t-0)^2 - 250$ ∴ vertex $(0, -250)$

b) Fill in table using vertex and two other points

t	d
10	$2.5(10-0)^2 - 250 = 250 - 250 = 0$
0	−250
−10	0

Sketch



• Labels + cross off

c) How deep was the diver when she started to ascend?

250 ft

d) How long did it take the diver to get to the surface? (sub depth= 0)

$0 = 2.5t^2 - 250$
$250 = 2.5t^2$
$100 = t^2$
$\pm 10 = t$ ∴ 10 sec

e) Suppose the diver had 20 sec of air left in her scuba tank, would she reach the surface safely?

$d = 2.5(20)^2 - 250$
$= 2.5(400) - 250$
$= 1000 - 250$
$= 750$ ∴ have enough for 750 feet ∴ yes. safe.

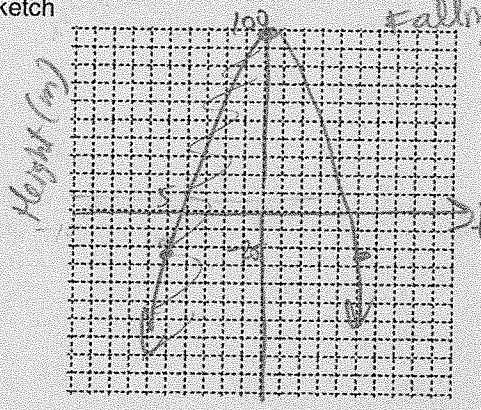
2.
If an object on land falls from a height of 100 m, its path can be represented by the equation $h = -5t^2 + 100$, where h represents the height of the object in metres, and t represents time in seconds.

a) What is the vertex? $h = -5(t-0)^2 + 100$ ∴ vertex $(0, 100)$

b) Fill in table using vertex and two other points

t	h
5	$-5(5-0)^2 + 100 = -125 + 100 = -25$
0	100
−5	−25

Sketch falling object



• Labels + cross off

c) From what height was the object dropped?

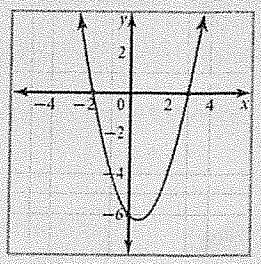
100 m

d) How long does it take to reach the ground? (sub h=0 and solve for t)

$0 = -5t^2 + 100$
$5t^2 = 100$
$t^2 = 20$
$t = \pm 4.5$ ∴ around 5 sec

3.
Which of these equations does the parabola represent?

a) $y = (x+2)(x-3)$
b) $y = (x-2)(x+3)$
c) $y = x^2 + x - 6$



4.

This building contains the equipment that pumps water from Lake Ontario to the Woodward Avenue Water Treatment Facility. A cross-section of the building is in the shape of a parabola. Its shape can be modelled by the quadratic relation $h = -0.045w^2 + 18$, where h represents the height in metres and w represents the horizontal distance in metres.

a) What form(s) is the equation in? What is the vertex?

Standard $= -0.045w^2 + 0w + 18$

Vertex $= -0.045(w-0)^2 + 18$ ∴ vertex $(0, 18)$

b) Find the zeros by factoring.

$h = \frac{-0.045w^2}{-0.045} + \frac{18}{-0.045}$

$h = -0.045(w^2 - 400)$

$h = -0.045(w+20)(w-20)$

Zeros: $w+20=0$, $w=-20$; $w-20=0$, $w=20$

c) Find the zeros by subbing in h=0 and solving for w

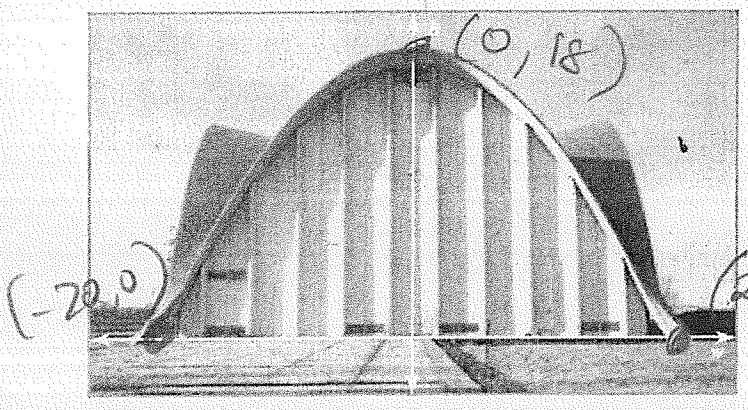
$0 = -0.045w^2 + 18$

$0.045w^2 = 18$

$\sqrt{w^2} = \sqrt{400}$

$w = \pm 20$

d) Label the vertex and zeros onto the given sketch



e) What is the height of the building?

18 m

f) Find the width of the building at ground level.

40m

5. Find the zeros from factored form

a) $y = (x+3)(x+1)$ **b)** $y = -(x-7)(x-3)$

$x+3=0$, $x=-3$; $x+1=0$, $x=-1$; $x-7=0$, $x=7$; $x-3=0$, $x=3$

c) $y = x(3x+6)$ d) $y = -2(4-x)(10-5x)$

$x=0$; $3x+6=0$, $3x=-6$, $x=-2$; $4-x=0$, $4=x$; $10-5x=0$, $10=5x$, $2=x$

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

a. $y = (2x+6)(5-x)$ Factored — see Zeros: $2x+6=0$, $2x=-6$, $x=-3$; $5-x=0$, $5=x$

b. $y = -5x^2 + 6x + 0$ Standard — see y-int $(0, 0)$

c. $y = x(12-2x)$ Factored — see Zeros: $x=0$; $12-2x=0$, $12=2x$, $6=x$

d. $y = 1.5(x-3)^2 + 0$ Vertex or Factored $1.5(x-3)(x-3)$ — see vertex = Zeros $(3, 0)$

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