

Properties of Quadratic Functions

1. Determine whether each function is linear, quadratic or neither.

a) *1st diff.*

x	y
-2	5
-1	7
0	11
1	17
2	25

1st diff. 1, 1, 1, 1
2nd diff. 2, 4, 6, 8
 2nd diff are constant.
 ∴ The relationship is quadratic.

b) *1st diff.*

x	y
0	5
1	-1
2	-7
3	-13
4	-19

1st diff. 1, 1, 1, 1
 1st diff are constant.
 ∴ The relationship is linear

c) *1st diff.*

x	y
-4	3
-2	6
0	12
2	24
4	48

1st diff. 2, 2, 2, 2
2nd diff. 3, 6, 12, 24
 1st and 2nd diff. are not constants
 Neither

2. Determine whether each equation represents a parabola that opens up or down.

a) $y = 3x^2 + 2x - 7$ *a=3 ☺*
 Opens up.

b) $y = -2(x - 3)(x + 1)$ *a=-2 ☹*
 Opens down.

c) $y = 4(x - 1)^2 + 3$ *a=4 ☺*
 Opens up.

3. State the zeros (x-intercepts) and the equation of the axis of symmetry.

a) $y = 2(x - 1)(x + 5)$

x-intercepts: 1 & -5

axis of symm:

$$x = \frac{1 + (-5)}{2}$$

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

$$x = -2$$

b) $y = -4x^2 + 8x + 12$

$$y = -4(x^2 - 2x - 3)$$

$$y = -4(x - 3)(x + 1)$$

x-intercepts: -1 & 3

axis of symm:

$$x = \frac{-1 + 3}{2}$$

$$x = 1$$

4. Determine the vertex of the parabola represented by each equation.

vertex form

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

vertex $\rightarrow (-3, -5)$

Factored form

b) $y = -3(x - 1)(x + 5)$

$$x = \frac{1 + (-5)}{2} \quad y = -3(-2-1)(-2+5)$$

$$x = -2 \quad y = -3(-3)(3)$$

$$y = 27$$

vertex $\rightarrow (-2, 27)$

5. Determine the x and y intercepts.

Factored form

a) $y = 2(x + 3)(x + 1)$

$y = 2(x^2 + x + 3x + 3)$

$y = 2(x^2 + 4x + 3)$

$y = 2x^2 + 8x + 6$

x-ints: -3 & -1

y-int: 6

standard form

b) $y = 2x^2 + 4x - 16$

$y = 2(x^2 + 2x - 8)$

$y = 2(x + 4)(x - 2)$

x-ints: -4 & 2

y-int: -16

6. A flare is launched from a sinking ship. The height of the flare, $H(t)$ in m, is modeled by the equation:

$$H(t) = -5t^2 + 30t + 35$$

where

- t is the elapsed time in seconds after the flare was launched.

How long was the flare airborne and what maximum height did it reach?

$H = -5t^2 + 30t + 35$

$H = -5(t^2 - 6t - 7)$

$H = -5(t + 1)(t - 7)$

t-ints: -1 & 7

H-int: 35

Vertex

$t = \frac{-1 + 7}{2}$

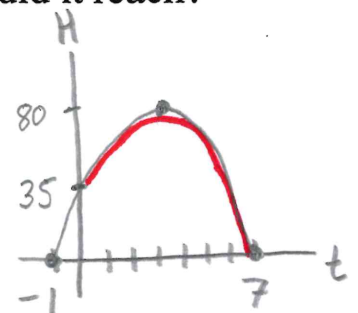
$= \frac{6}{2}$

$t = 3$

$H = -5(3+1)(3-7)$
 $= -5(4)(-4)$

$H = 80$

vertex $\rightarrow (3, 80)$



\rightarrow The flare was airborne for 7 seconds.

\rightarrow The flare reached a max height of 80m after 3 seconds.