$h = \frac{-3}{2}$; $k = f\left(-\frac{3}{2}\right)$

$k = \left(-\frac{3}{2}\right)^2 + 3\cdot\left(-\frac{3}{2}\right) - 10$

$k = \frac{9}{4} - \frac{9}{2} - 10$

$k = \frac{9 - 18 - 40}{4} = -\frac{49}{4}.$

$h = -\frac{3}{2}$; $k = -\frac{49}{4}.$

Standard Form: $f(x) = \left(x - \left(-\frac{3}{2}\right)\right)^2 - \frac{49}{4}$

$f(x) = \left(x + \frac{3}{2}\right)^2 - \frac{49}{4}$

Vertex: $\left(-\frac{3}{2}, -\frac{49}{4}\right)$; points upward

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E.g. Given $f(x) = -x^2 + 4x + 1$.

1. Turn this into standard form. Find vertex.
2. Graph this parabola. (Graph 5 points)

1) $a = -1$; $b = 4$

$$h = -\frac{b}{2a} = \frac{-4}{2\cdot(-1)} = \frac{-4}{-2} = 2$$

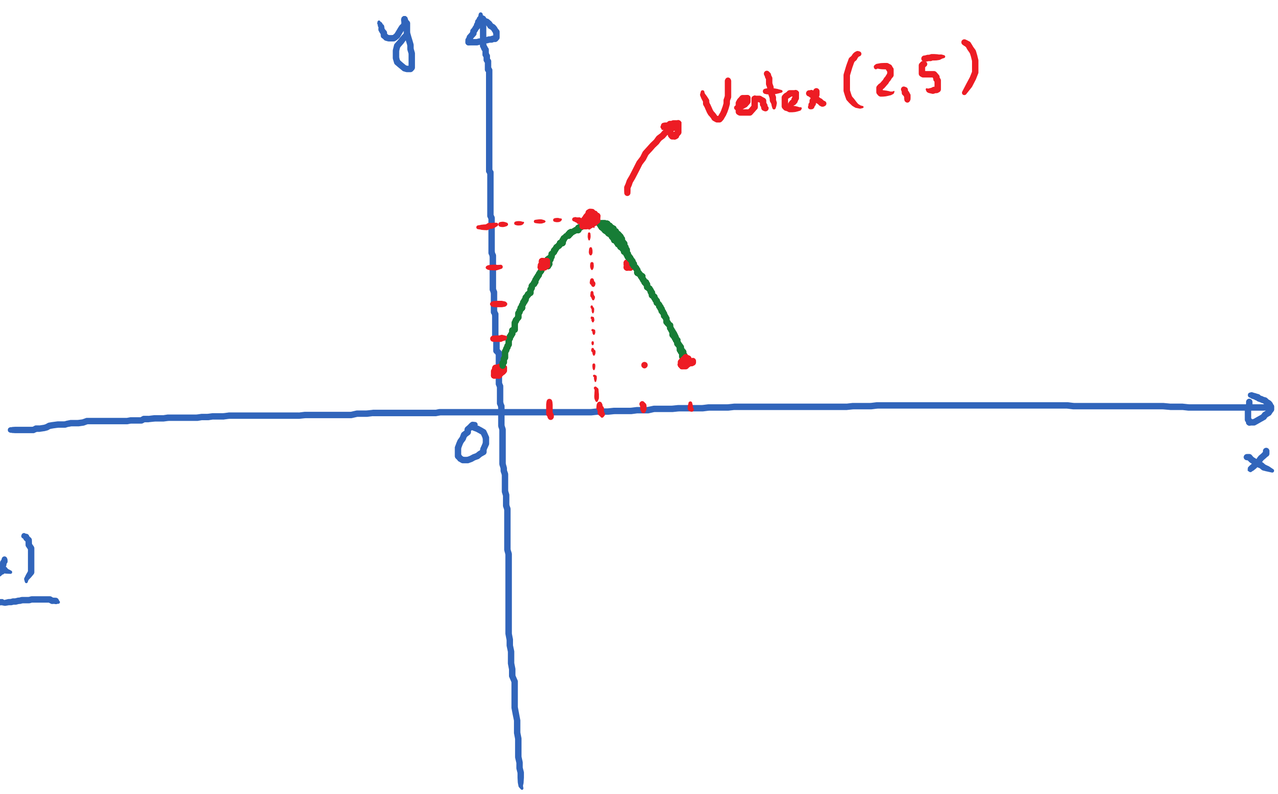
$$k = f(2) = -(2)^2 + 4\cdot 2 + 1$$
$$= -4 + 8 + 1 = 5$$

$h = 2$; $k = 5$

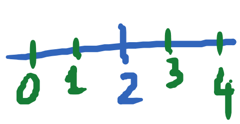
$$f(x) = -(x-2)^2 + 5 .$$

Vertex : $(2, 5)$. Points down ward.

2)



x	$f(x)$
2	5
1	4
3	4
0	1
4	1



Obj 3: Find Max/Min of Quadratic Functions

E.g. $f(x) = 4x^2 - 16x + 1000$

1. Does f have a maximum or a minimum?
2. Find it.

1. Since $a = 4 > 0$, the parabola points upward.
   So the function has a minimum.
2. The minimum value = y-part of vertex = k.

$$h = \frac{-(-16)}{2 \cdot 4} = \frac{16}{8} = 2.$$

$$k = f(2) = 4 \cdot (2)^2 - 16 \cdot 2 + 1000$$
$$= 4 \cdot 4 - 16 \cdot 2 + 1000$$
$$= 984$$

The minimum value of the function is 984.
It achieves its minimum when $x = 2$.

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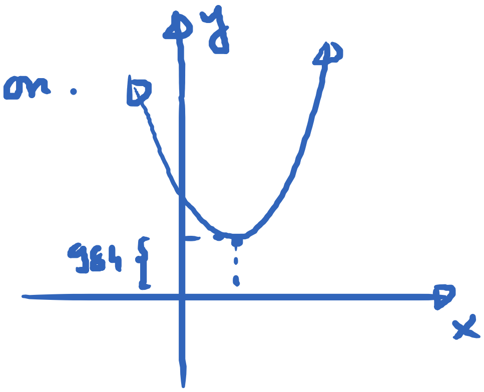
(3) Find the range of the function.



Range = $[984, \infty)$

Domain = $(-\infty, \infty)$

Ex. $f(x) = -2x^2 + 8x - 3$

(1) Does this function have a max or a min?

(2) Find it

(3) Find Domain and Range of f.

(1) Since $a = -2 < 0$, the parabola points downward.

Hence, f has a max

(2) $h = \dfrac{-8}{2\cdot(-2)} = \dfrac{-8}{-4} = 2$

$k = f(2) = -2\cdot(2)^2 + 8\cdot 2 - 3 = 5$

So, the max value of f = k = 5. It achieves the max value when $x = 2$.

(3) Domain = $(-\infty, \infty)$. Range = $(-\infty, 5]$.