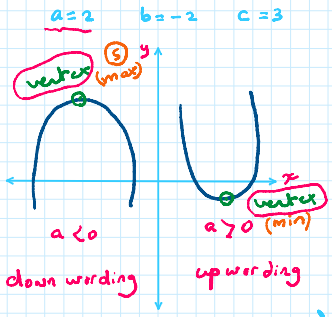
Chapter 3.1

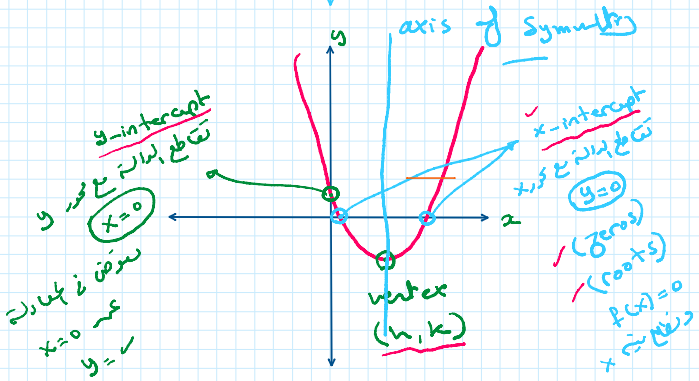
Quadratic function الدوال التربيعية

$$f(x) = ax^2 + bx + c$$

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

$a=2$ $b=-2$ $c=3$





quadratic function:

① vertex: (h, k)

$h = \frac{-b}{2a}$, k = بالدالة h عوض عن

② x-intercept: $y=0 \rightarrow x$

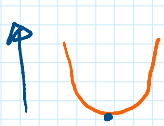
③ y-intercept: $x=0 \rightarrow y$

④ $\underline{\min = k}$ $a>0$ $\qquad$ $\underline{\max = k}$ $a<0$

⑤ axis of Symmetry: $x = h$

⑥ domain $= R = (-\infty, \infty)$

⑦ range =

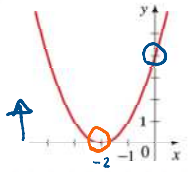


range $= [k, \infty)$



range $= (-\infty, k]$

Question (1): The graph of a quadratic function f is given. Find:
(a) the vertex.
(b) the maximum or minimum value.
(c) the x – intercept and y –intercept.
(d) the domain and range of f.
(e) the axis of symmetry.



a) vertex = $(-2, 0)$ (h, k)

b) min = $k = 0$

c) x-intercept = $(-2, 0)$

y-intercept = $(0, 4)$

d) domain = $(-\infty, \infty)$

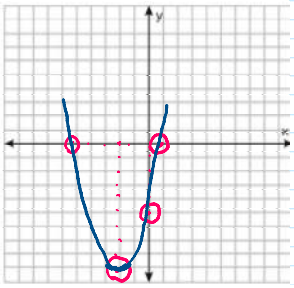
range $= [k, \infty)$

$= [0, \infty)$

e) $x = h$

$\boxed{x = -2}$ axis of symmetry

Question (2): (a) If f is a quadratic function and $f(x) = x^2 + 4x - 5$.
a) Find the vertex.
b) Find the maximum or minimum value.
c) Find x and y-intercepts.
d) sketch the graph of f.
e) Find the domain and range of f.
f) the axis of symmetry.



$f(x) = x^2 + 4x - 5$

$a = 1 \quad b = 4 \quad c = -5$

a) vertex: (h, k)

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

$k = (-2)^2 + 4(-2) - 5$

$k = 4 - 8 - 5 = -9$

$(-2, -9)$
$h \quad k$

b) min $= -9$

c) x-intercept:

$f(x) = 0$

$x^2 + 4x - 5 = 0$

$(x + 5)(x - 1) = 0$

$x + 5 = 0 \qquad x - 1 = 0$

$x = -5 \qquad x = 1$

x-intercept:

$(-5, 0)$, $(1, 0)$

y-intercept: $x = 0$

$y = (0)^2 + 4(0) - 5 = -5$

$(0, -5)$

d) Sketch

① vertex

② x-intercept, y-intercept

e) domain $= (-\infty, \infty)$

range $= [-9, \infty)$

f) axis of Symmetry:

$\boxed{x = -2}$

b) If f is a quadratic function and $f(x) = 4x - 2x^2$

a) Find the vertex.

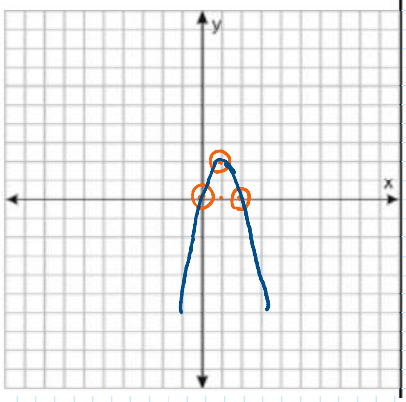
b) Find the maximum or minimum value.

c) Find x and y-intercepts.

d) sketch the graph of f.

e) Find the domain and range of f.

f) the axis of symmetry.



$f(x) = 4x - 2x^2$

$a = -2 \quad b = 4 \quad c = 0$

a) vertex (h, k)

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

$k = 4(1) - 2(1)^2 = 4 - 2 = 2$

$(1, 2)$

b) max = 2

c) x-intercept:

$f(x) = 0$

$4x - 2x^2 = 0$

$2x(2 - x) = 0$

$\frac{2}{2}x = \frac{0}{2}$ $\qquad 2 - x = 0$

$x = 0$ $\qquad 2 = x$

$x = 2$

$(0, 0)$ $\qquad (2, 0)$

y-intercept:

$x = 0$

$f(x) = 4x - 2x^2$

$y = 4(0) - 2(0)^2 = 0$

$(0, 0)$

e) domain $= (-\infty, \infty)$

range $= (-\infty, 2]$

f) $x = 1$

c) If f is a quadratic function and $f(x) = 3x^2 - 6x + 3$

a) Find the vertex.

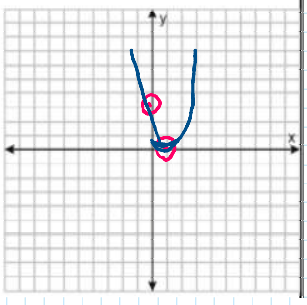
b) Find the maximum or minimum value.

c) Find x and y-intercepts.

d) sketch the graph of f

e) Find the domain and range of f.

f) the axis of symmetry.



$f(x) = 3x^2 - 6x + 3$

$a = 3 \quad b = -6 \quad c = 3$

a) vertex:

$h = \frac{-b}{2a} = \frac{-(-6)}{2(3)} = \frac{6}{6} = 1$

$k = 3(1)^2 - 6(1) + 3$

$= 3 - 6 + 3 = 0$

$(1, 0)$

2.

$3-6+3=0$

$(1,0)$

e) domain $= (-\infty, \infty)$

range $= [0, \infty)$

f) $x = 1$

b) min $= 0$

c) x-intercept:

$f(x) = 0$

$3x^2 - 6x + 3 = 0 \quad \div 3$

$x^2 - 2x + 1 = 0$

$(x-1)(x-1) = 0$

$x - 1 = 0$

$\boxed{x = 1} \quad (1,0)$

y-intercept

$y = 3(0)^2 - 6(0) + 3 = 3$

$(0,3)$

d) If f is a quadratic function and $f(x) = x^2 - 4$

a) Find the vertex.

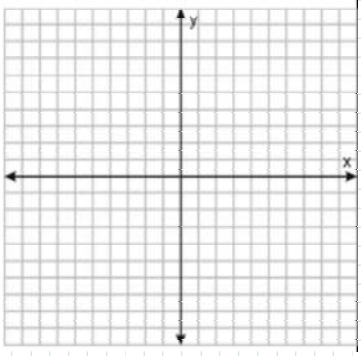
b) Find the maximum or minimum value.

c) Find x and y-intercepts.

d) sketch the graph of f

e) Find the domain and range of f.

f) the axis of symmetry.



e) If f is a quadratic function and $f(x) = x^2 + 5$

a) Find the vertex.

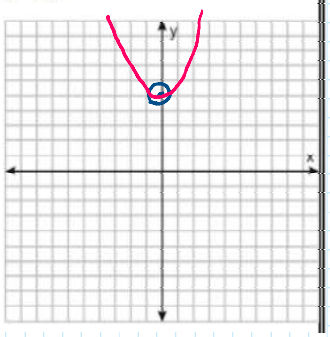
b) Find the maximum or minimum value.

c) Find x and y-intercepts.

d) sketch the graph of f

e) Find the domain and range of f.

f) the axis of symmetry.



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

a) vertex

$a = 1$ $b = 0$ $c = 5$

$h = \frac{-b}{2a} = \frac{0}{2(1)} = 0$

$k = 5$

$(0, 5)$

b) x-intercept

$f(x) = 0$

$x^2 + 5 = 0$

$x^2 = -5$

no x-intercept

y-intercept

$x = 0$

$f(x) = 0^2 + 5 = 5$

e) domain $= (-\infty, \infty)$

range $= [5, \infty)$

f) $x = 0$