

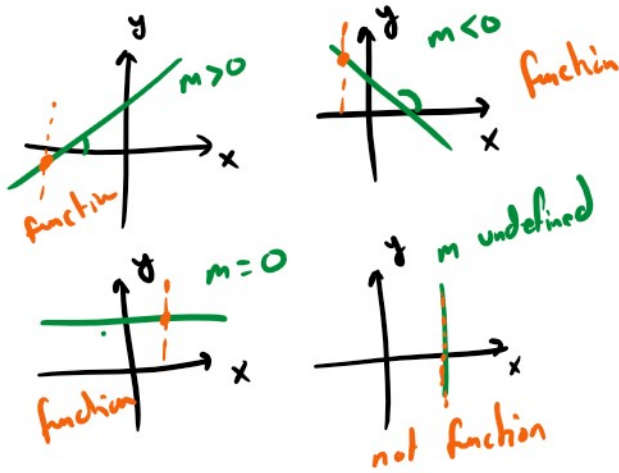
صباح الخير
→

Functions

linear

$$y = ax + b$$

poly of degree 1



Power function

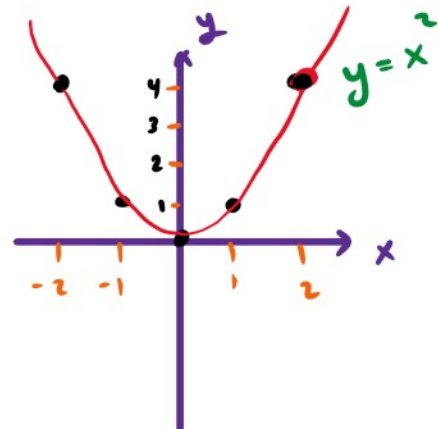
Exp $y = x^2$, $y = x^3$, $y = 5x^4$

$y = 2x^1$ → power
 → linear

Exp

$$y = x^2$$

x	-2	-1	0	1	2
y	4	1	0	1	4



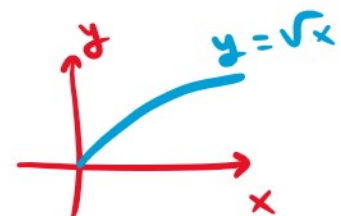
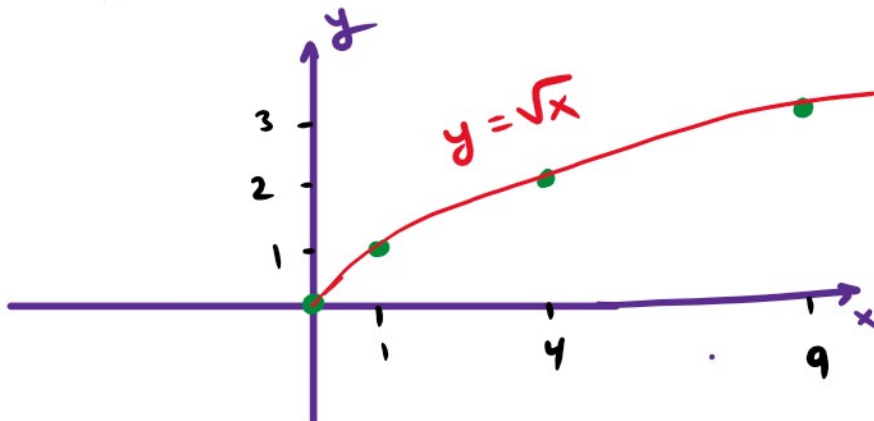
Root function

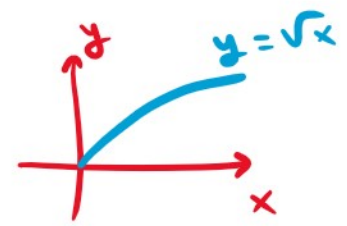
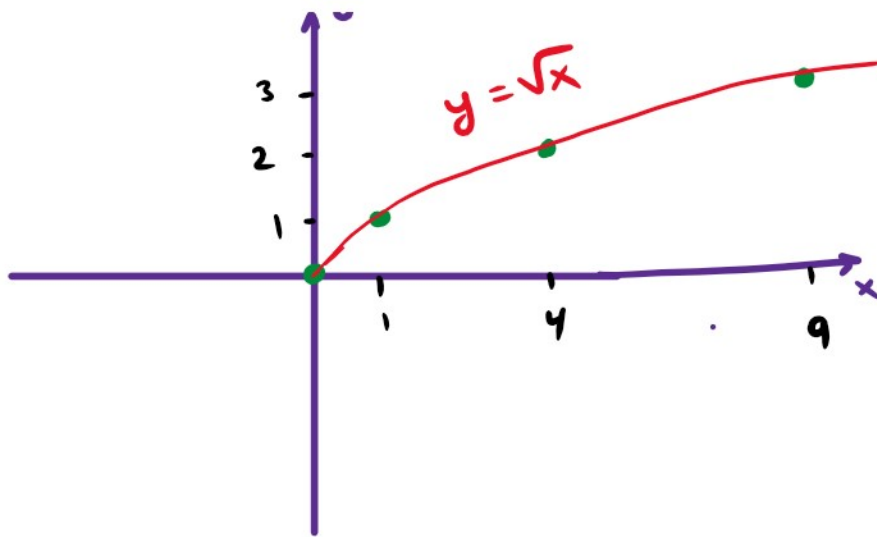
Abs. Value

Root function

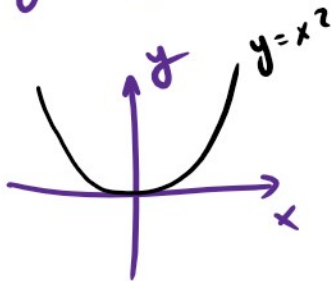
$$y = \sqrt{x}$$

x	0	1	4	9
y	0	1	2	3

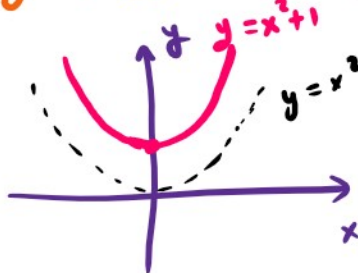




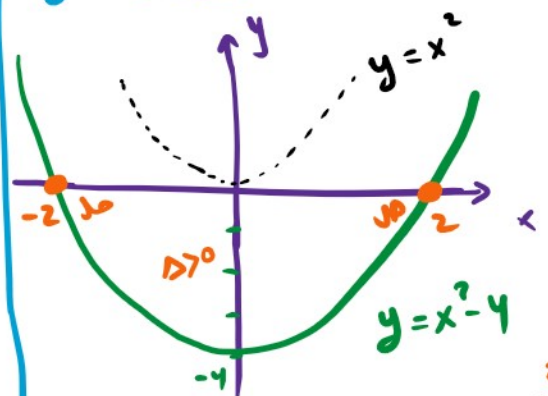
$$y = x^2$$



$$y = x^2 + 1 \text{ up by 1 unit}$$



$$y = x^2 - 4 \text{ down by 4 units}$$



$$x\text{-intercept} \Rightarrow y = 0 \Rightarrow 0 = x^2 - 4$$

$$x^2 = 4 \Rightarrow \sqrt{x^2} = \sqrt{4}$$

$$|x| = 2$$

$$x = 2 \quad x = -2$$

$$y = x^2$$

$$y = x^2 + a \quad (a > 0)$$

units, a نفس x^2 راسه، x^2 نفس

$$y = x^2 - a$$

a نفس x^2 راسه

Exp

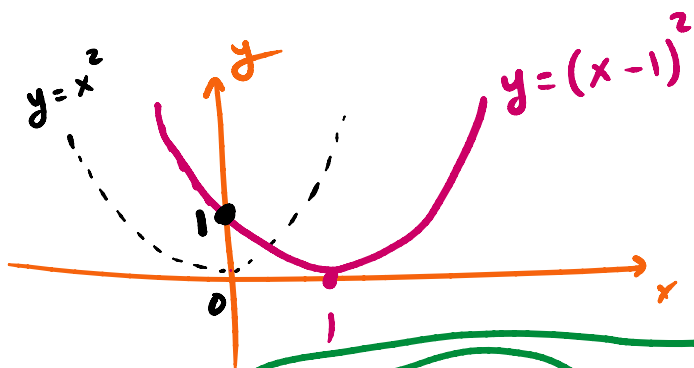
$$y = (x-1)^2$$

نفس راسه x^2 راسه لليمين خطوة

$$u = x^2 \quad \uparrow y$$

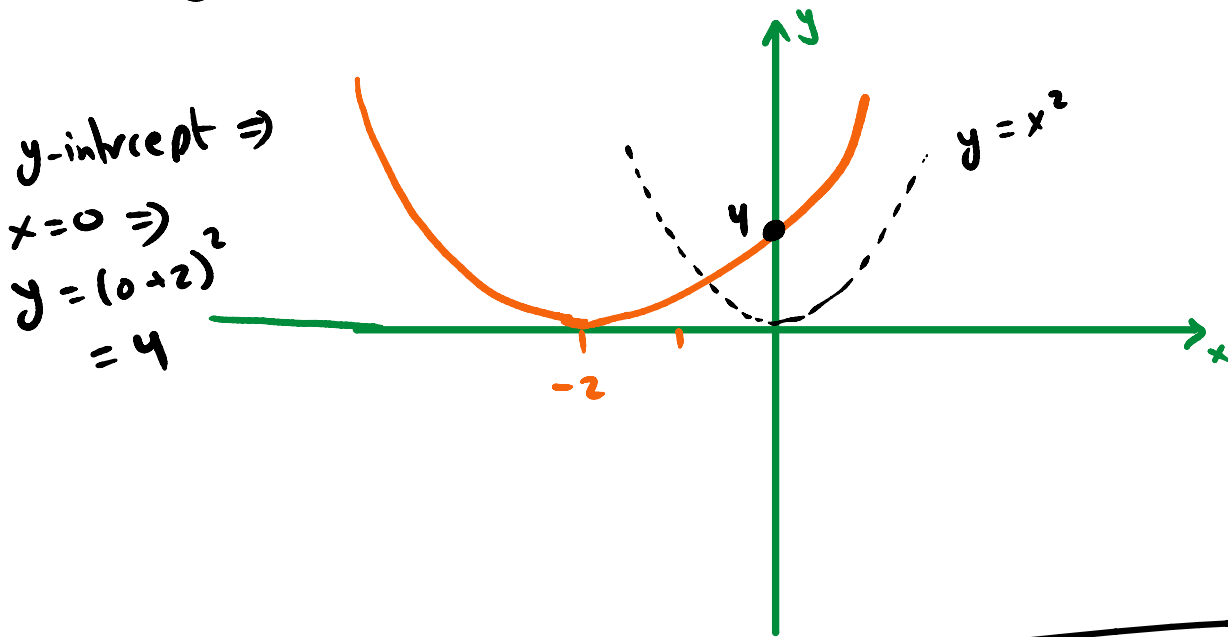
$$y = (x-1)^2$$

$$y\text{-intercept} \Rightarrow x = 0$$



y-intercept $\Rightarrow x=0$
 $y = (0-1)^2 = (-1)^2 = 1$

نفسه x^2 ولكن لليسار خطوطين
 $y = (x+2)^2$



y-intercept $\Rightarrow$
 $x=0 \Rightarrow$
 $y = (0+2)^2 = 4$

$a > 0$

$y = (x+a)^2$: shift x^2 to the left by a units

$y = (x-a)^2$: = = = = right = =

Exp sketch ① $y = (x+1)^2$ ② $y = x^2 + 3$

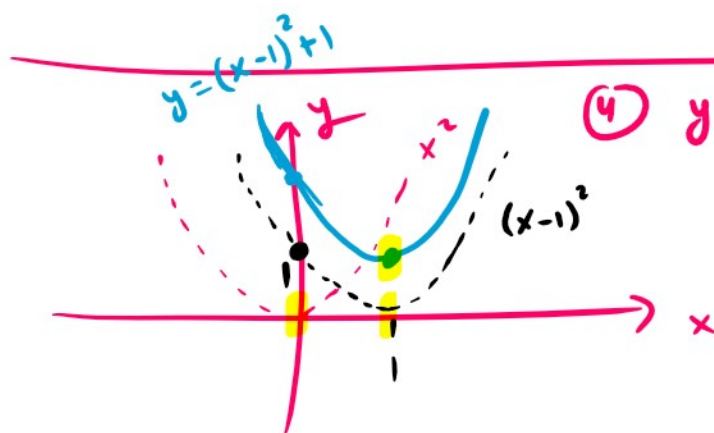
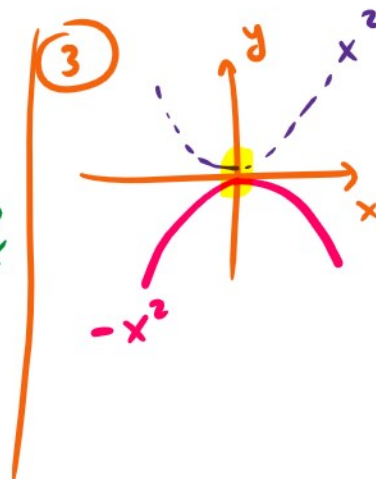
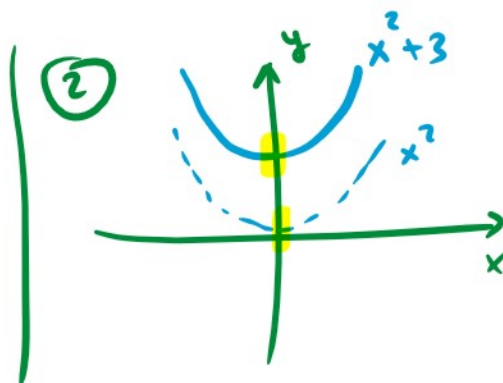
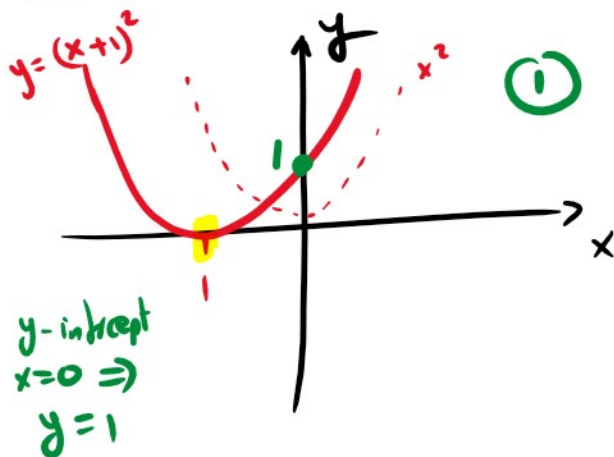
Exp sketch

① $y = (x+1)^2$ ② $y = x^2 + 3$

③ $y = -x^2$

④ $y = (x-1)^2 + 1$

⑤ $y = (x+2)^2 - 1$



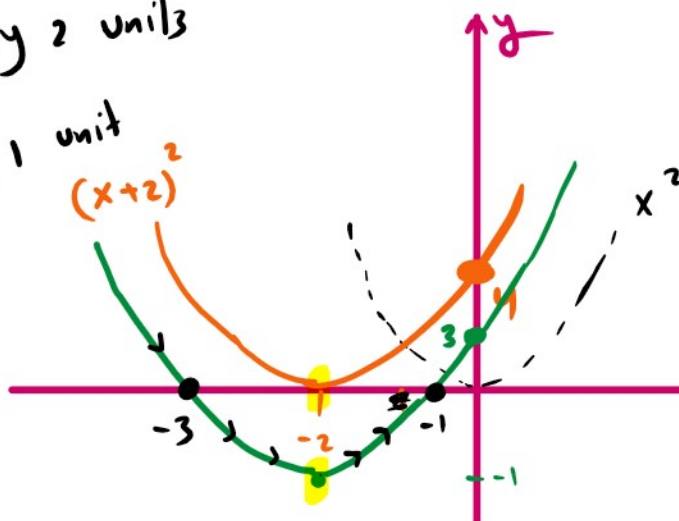
④ $y = (x-1)^2 + 1$

shift right 1 unit
= up 1 =

⑤ $y = (x+2)^2 - 1$

shift left by 2 units

shift down by 1 unit



x-intercept $\Rightarrow y = 0$

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

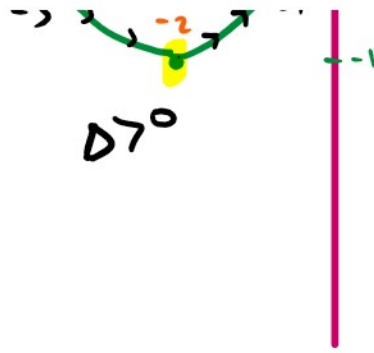
$0 = x^2 + 2(x)(2) + (2)^2 - 1$

$0 = x^2 + 4x + 4 - 1$

$0 = x^2 + 4x + 3$

$0 = (x+1)(x+3)$

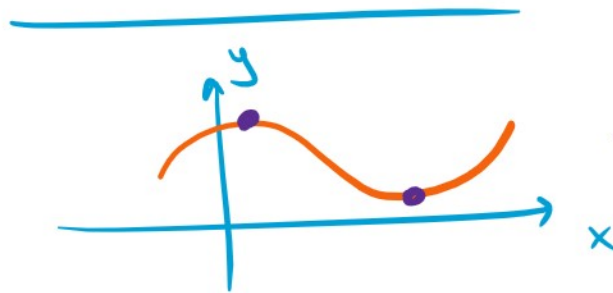
$x = -1$



$\downarrow$
 $x = -1$
 $\downarrow$
 $x = -3$

In All graphs above $\Rightarrow$ we have one Turning point (vertex)

x^2



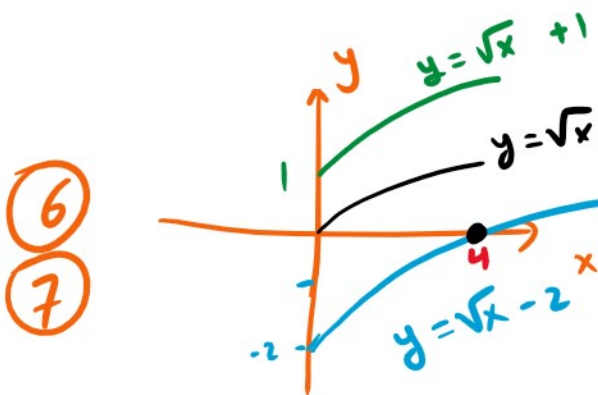
2 turning points
but this not x^2

Exp ① $y = \sqrt{x+1}$ ② $\sqrt{x-2}$ ③ $y = -\sqrt{x}$

④ $y = -\sqrt{x+3}$ ⑤ $y = -(x+1)^2 - 2$

⑥ $y = \underline{\underline{\sqrt{x}}} + 1$

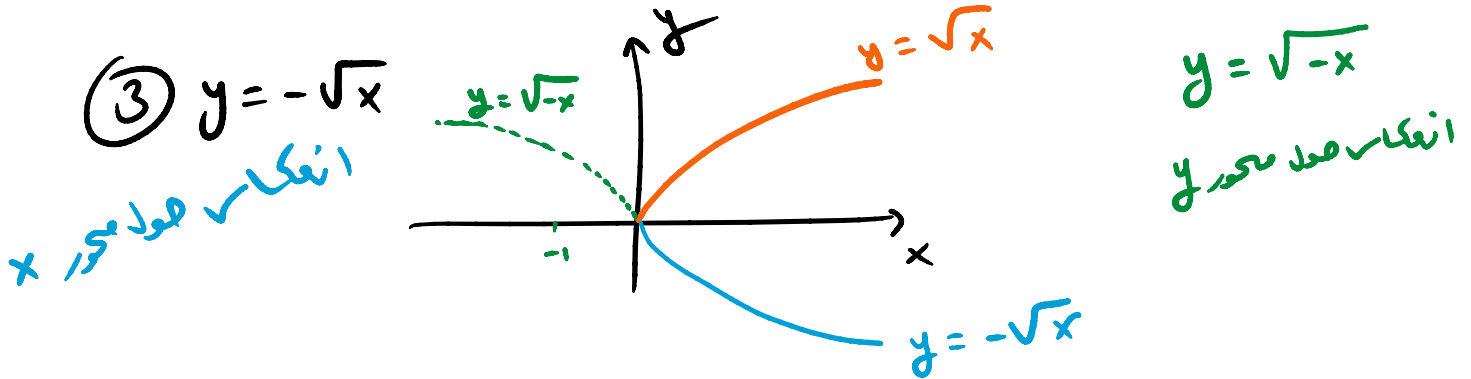
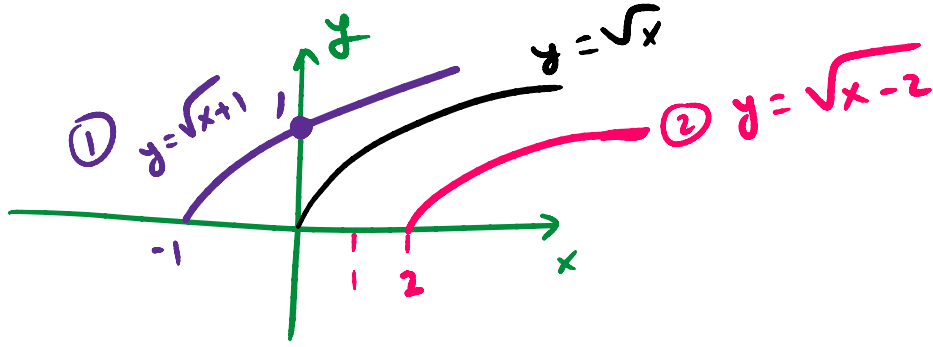
⑦ $y = \sqrt{x} - 2$



$x \text{ intercept} \Rightarrow y = 0 \Rightarrow 0 = \sqrt{x} - 2$
 $+2$
 $2 = \sqrt{x}$
 $4 = x$

2-3

$$y = x$$



کثیرا کدر Poly

① $y = 2x^3 - 5x$ poly of degree 3 (rational)

② $y = \frac{x^2 - 3}{x^5}$ not poly $\Rightarrow$ its rational function
افتران سببی

افتران سببی از صفر

Poly: $y = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$

Rational function = $\frac{\text{Poly}}{\text{Poly}}$

! ! n... of degree 1

③ $y = 2x - \frac{1}{2}$ poly of degree 1
(rational)

Every poly is Rational

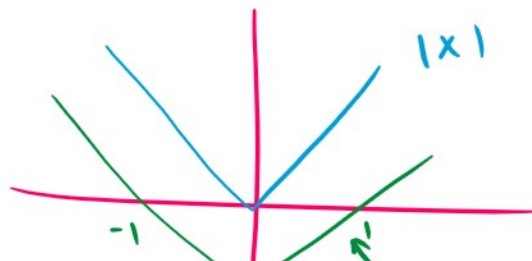
④ $y = \sqrt{x} = x^{\frac{1}{2}}$ not poly
not rational

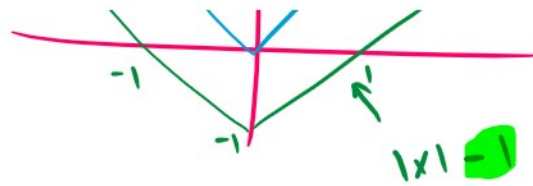
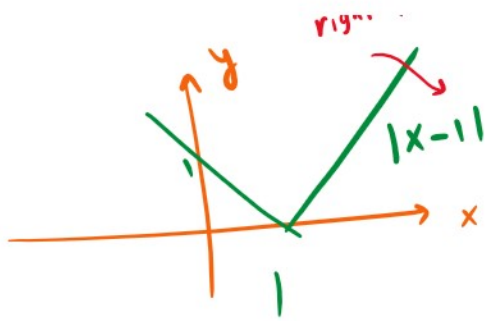
⑤ $y = \frac{1}{x}$ not poly $\times$ $\frac{1}{x} = x^{-1}$
Rational ✓

⑥ $y = 7$ - poly $7 = 7x^0$
Rational $7 = \frac{7}{1}$

Exp $y = |x|$

right 1 unit
↗





left 3 units

down 1 unit

