2.1 Part 2

Thursday, December 9, 2021 9:11 AM

Exp Use quadratic formula to solve

$ax^2 + bx + c = 0$, $a \neq 0$

$\Delta = b^2 - 4ac$ المميز

↳ Discriminant

1. If $\Delta > 0 \Rightarrow \exists$ two different real roots
2. If $\Delta = 0 \Rightarrow \exists$ only one real root
3. If $\Delta < 0 \Rightarrow \nexists$ real roots

1 + 2 $\Rightarrow$ to find the roots $\Rightarrow$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a}$$

quadratic formula

(1) $2x^2 - 3x = -1$

$\quad +1 \quad +1$

$$\boxed{2x^2 - 3x + 1 = 0}$$

$a = 2$
$b = -3$
$c = 1$

$$\Delta = b^2 - 4ac$$
$$= (-3)^2 - 4(2)(1)$$
$$= 9 - 8$$
$$= 1 \Rightarrow \exists \text{ two roots}$$

$$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-(-3) \pm \sqrt{1}}{2(2)}$$

$$= \frac{3 \pm 1}{4}$$

$$x_1 = \frac{3+1}{4} = \frac{4}{4} = 1$$

$$x_2 = \frac{3-1}{4} = \frac{2}{4} = \frac{1}{2}$$

$2x^2 - 3x = -1$

Check $x_1 = 1 \Rightarrow 2(1)^2 - (3)(1) \stackrel{?}{=} -1$

$2 - 3 = -1$ ✓

check $x_2 = \frac{1}{2} \Rightarrow 2\left(\frac{1}{2}\right)^2 - 3\left(\frac{1}{2}\right) \stackrel{?}{=} -1$

$\cancel{2}\left(\frac{1}{\cancel{4}_{2}}\right) - \frac{3}{2} \stackrel{?}{=} -1$

$\frac{1}{2} - \frac{3}{2} \stackrel{?}{=} -1$

$\frac{1-3}{?} \quad ? \quad 1$

$\frac{1}{2} - \frac{}{2} = -1$

$\frac{1-3}{2} \stackrel{?}{=} -1$

$\frac{-2}{2} = -1$ ✓

(2) $(x-2)^2 + 3(x-2) + \frac{9}{4} = 0$

$x^2 + 2(x)(-2) + (-2)^2 + 3x - 6 + \frac{9}{4} = 0$

$x^2 - 4x + 4 + 3x - 6 + \frac{9}{4} = 0$

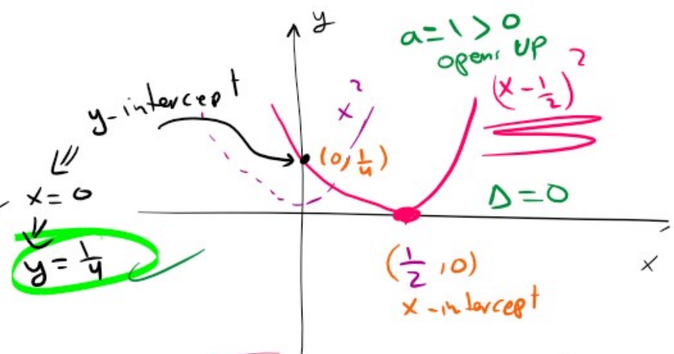
$x^2 - x \boxed{-2 + \frac{9}{4}} = 0$

$\frac{9}{4} - \frac{2 \times 4}{\times 4} = \frac{9}{4} - \frac{8}{4}$

$= \frac{9-8}{4} = \frac{1}{4}$

$\boxed{x^2 - x + \frac{1}{4} = 0} \Rightarrow (x - \frac{1}{2})^2 = 0$

$a = 1$ , $b = -1$ , $c = \frac{1}{4}$




$\Delta = b^2 - 4ac$

$= (-1)^2 - 4(1)(\frac{1}{4})$

$= 1 - 1$

$= 0 \Rightarrow \exists$ only one root

$x^2 - x + \frac{1}{4} = (x - \frac{1}{2})^2$

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

$= x^2 - x + \frac{1}{4}$

$x = \frac{-b \pm \sqrt{\Delta}}{2a} = \frac{-(-1) \pm \sqrt{0}}{2(1)} = \frac{1 \pm 0}{2} = \frac{1}{2}$ ✓

Check $(x-2)^2 + 3(x-2) + \frac{9}{4} \stackrel{?}{=} 0$

## Check

$$(x-2) + 3(x-2) + \frac{9}{4} \overset{?}{=} 0$$

$$\left(\frac{1}{2} - \frac{2\times 2}{\times 2}\right)^2 + 3\left(\frac{1}{2} - \frac{2\times 2}{2\times 1}\right) + \frac{9}{4} \overset{?}{=} 0$$

$$\left(\frac{-3}{2}\right)^2 + 3\left(\frac{-3}{2}\right) + \frac{9}{4} \overset{?}{=} 0$$

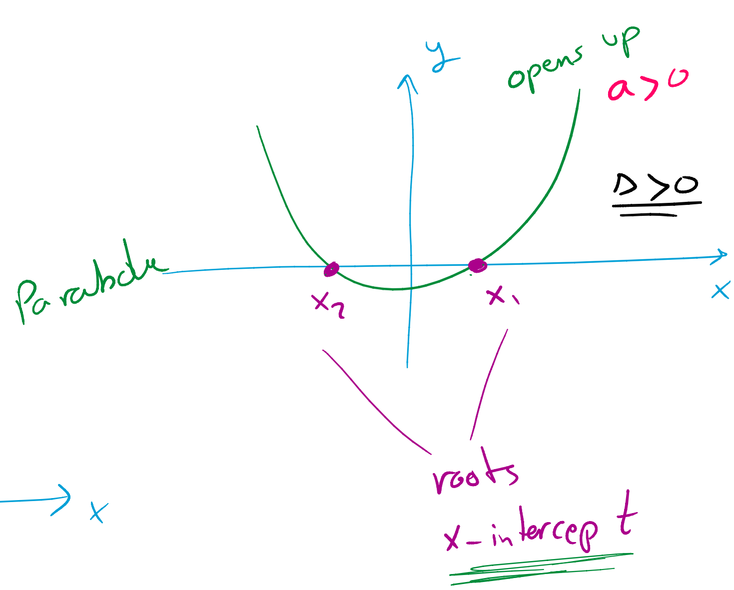
$$\frac{9}{4} + \frac{-9}{2} + \frac{9}{4} \overset{?}{=} 0$$

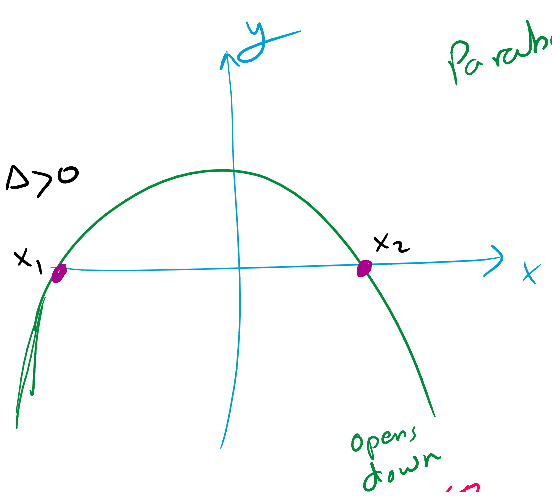
$$\frac{9+9}{4} - \frac{9}{2} \overset{?}{=} 0$$

$$\frac{\cancel{18}^{\,9}}{\cancel{4}_{\,2}} - \frac{9}{2} \overset{?}{=} 0$$

$$\frac{9}{2} - \frac{9}{2} = 0$$

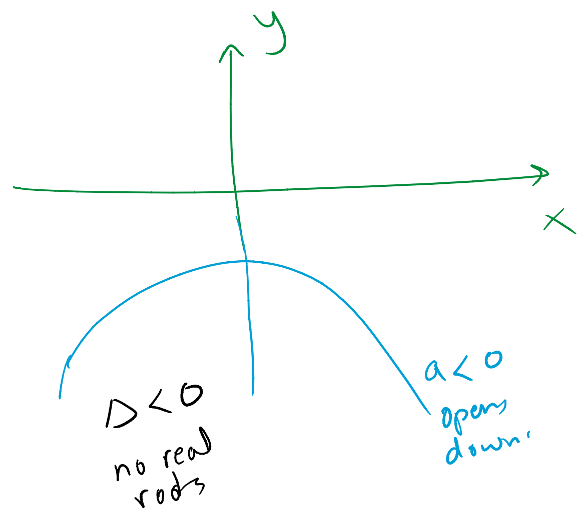
$$ax^2 + bx + c = 0$$

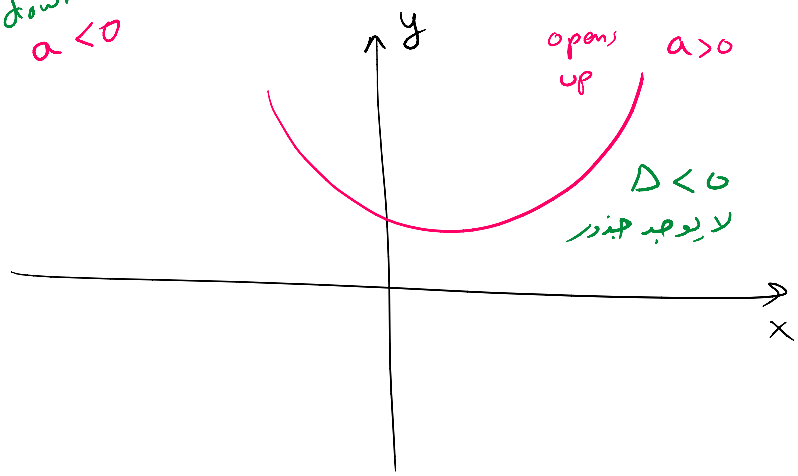


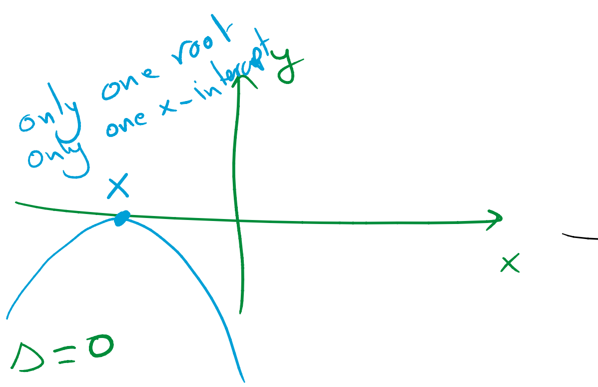



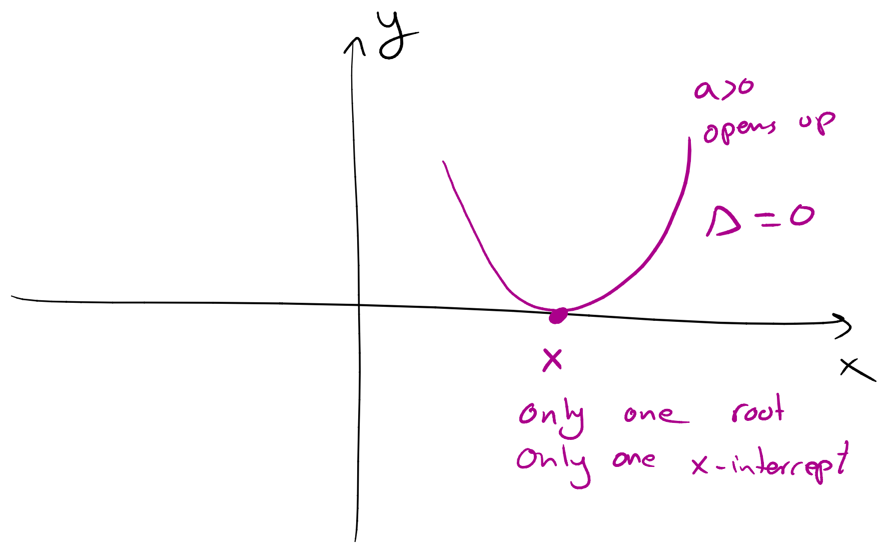

 

opens down
$a<0$




3 $\quad 2 - x = x^2$ $\quad$ using quadratic formula

$-x^2 \qquad -x^2$

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

$x^2 + x - 2 = 0$

$a = 1, \quad b = 1, \quad c = -2 \quad \Rightarrow \quad \Delta = b^2 - 4ac$

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

$a = 1, \quad b = 1, \quad c = -2$

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

$= 1 + 8$

$= 9 \Rightarrow \exists$ two real roots

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-1 \pm \sqrt{9}}{2(1)}$$

$$= \frac{-1 \pm 3}{2}$$

$$x_1 = \frac{-1+3}{2} = \frac{2}{2} = 1 \checkmark$$

$$x_2 = \frac{-1-3}{2} = \frac{-4}{2} = -2 \checkmark$$

check $\quad 2 - x = x^2$

$x_1 = 1 \Rightarrow 2 - (1) \stackrel{?}{=} (1)^2$

$1 = 1 \checkmark$

$x_2 = -2 \Rightarrow 2 - (-2) \stackrel{?}{=} (-2)^2$

$2 + 2 = 4 \checkmark$

or using factoring

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

$a + b = 1$

$ab = -2$

$$(x + a)(x + b) = 0$$

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

$(x + \cancel{2}) = 0$ $\quad$ $-2 \quad -2$ $\quad$ or $\quad$ $x - \cancel{1} = 0$ $\quad$ $+1 \quad +1$

$x_2 = -2$, $\quad x_1 = 1$