These values are also the x-coordinates of the x-intercepts.

So, to find zeros (or roots, or x-intercepts) of f, we just need to set the equation for f equal to zero.

E.g. Given $f(x) = (x+1)(2x-3)^2$.

Q1: Find the zeros of f.

Q2: Find the multiplicity of each zero.

Sol:

multiplicity

Q1: To find zeros:

$$\text{Set } (x+1)^{\boxed{1}}(2x-3)^{\boxed{2}} = 0$$

$$x+1 = 0 \quad ; \quad (2x-3)^2 = 0$$

$$\boxed{x = -1} \qquad 2x - 3 = \pm\sqrt{0} = 0$$

$$2x - 3 = 0$$

$$\boxed{x = \frac{3}{2}}$$

The zeros of f are: -1 and $\frac{3}{2}$

Q2: $x = -1$ has multiplicity $\boxed{1}$.

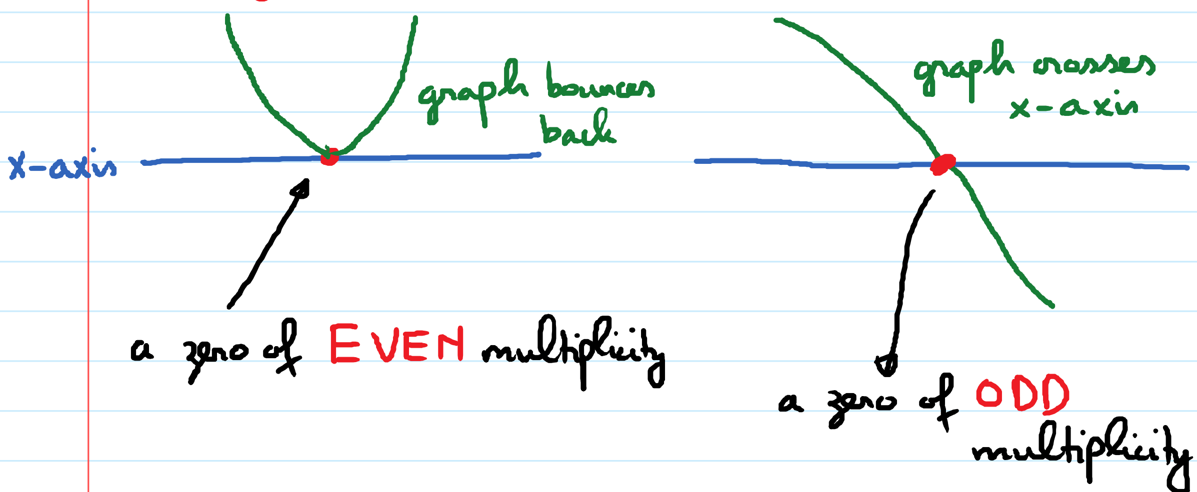
$x = \frac{3}{2}$ has multiplicity $\boxed{2}$.

E.g. $f(x) = \left(x+\frac{1}{2}\right)^{\boxed{4}}(x-5)^{\boxed{3}}$

Find the zeros of f and multiplicity of each zero

The zeros are : $\underbrace{x = -\frac{1}{2}}_{\text{multiplicity} = 4}$ and $\underbrace{x = 5}_{\text{multiplicity} = 3}$.

* Why is the multiplicity important ?



Obj 3: Graph polynomial functions.

Process:

Step 1: Determine the end behavior using the leading term test.

Step 2: Determine the zeros and the multiplicity of each zero.

Step 3: Find the y-intercept.

Set $x = 0$ in the formula of f.

Step 4: Graph the function

E.g. Graph the function $f(x) = -2(x-1)^2(x+2)$

Step 1: End Behavior.

odd

Leading Term $= (-2)\cdot(x)^2\cdot(x) = \boxed{-2}x^{\boxed{3}}$

<0

$\rightarrow$ End Behavior: Rises left, Falls Right. ↖ ↘

Step 2: Zeros and their multiplicity.

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

$\rightarrow (x-1)^2 = 0 \quad ; \quad x+2 = 0$

$x - 1 = 0 \quad ; \quad \boxed{x = -2}$

multiplicity $= 1 \rightarrow$ odd

crosses

$\boxed{x = 1}$

multiplicity $= 2 \rightarrow$ even

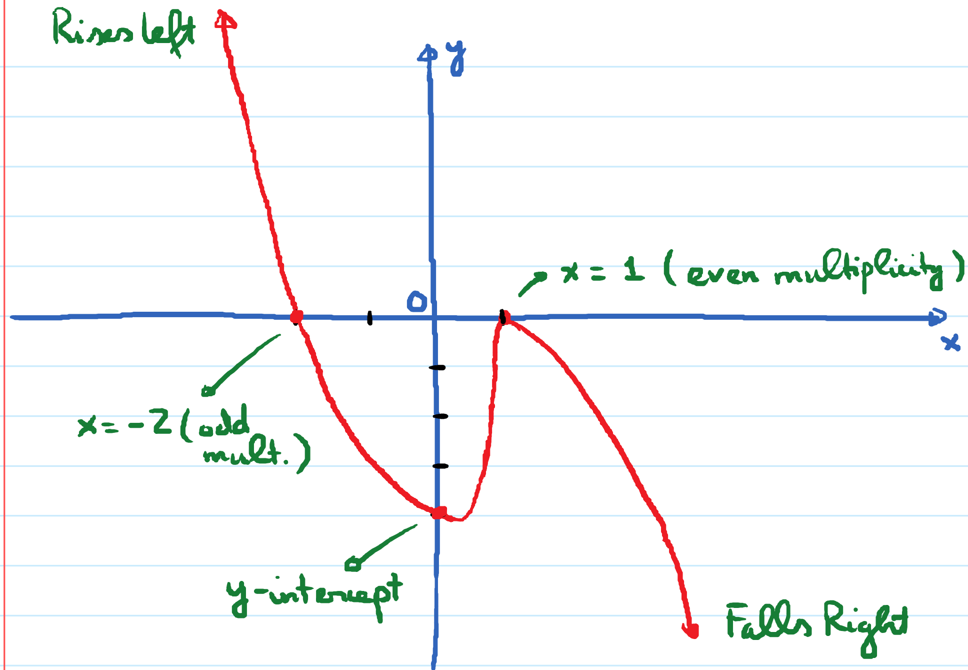
graph bounces back

Step 3: y-intercept

Set $x = 0$: $f(0) = -2(0-1)^2\cdot(0+2)$

$f(0) = -4$

y-intercept: $(0, -4)$


Rises left
y
0
x = 1 (even multiplicity)
x
x = -2 (odd mult.)
y-intercept
Falls Right