

Equations & Graphs of polynomial $f(x)$'s

If a polynomial, $P(x)$, has a factor, $x-a$, that is repeated 'n' times, then the zero $x=a$ has a multiplicity of n

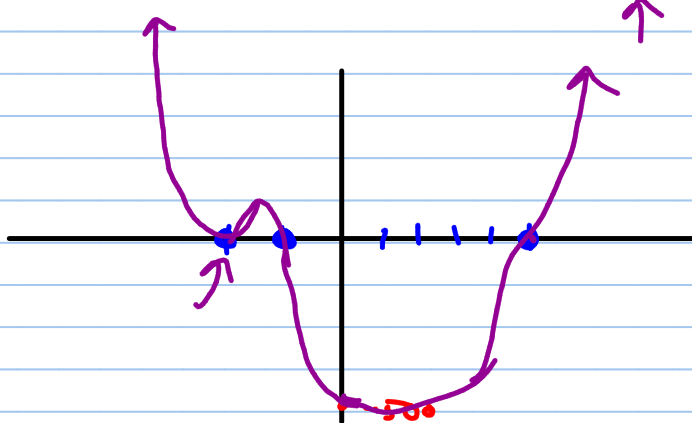
Ex: $f(x) = \underline{\underline{+}}(x+2)^2(x-5)^3(x+1)$

(x
→ Sketch:

The zero $x=-2$ has a multiplicity of 2 (like the top or bottom of a parabola)

$x=5$ has a multiplicity of 3 looks like $y=x^3$ as it crosses the x-axis

Degree: 6



$$(x+2)(x+2)(x-5)(x-5)(x-5)(x+1)$$

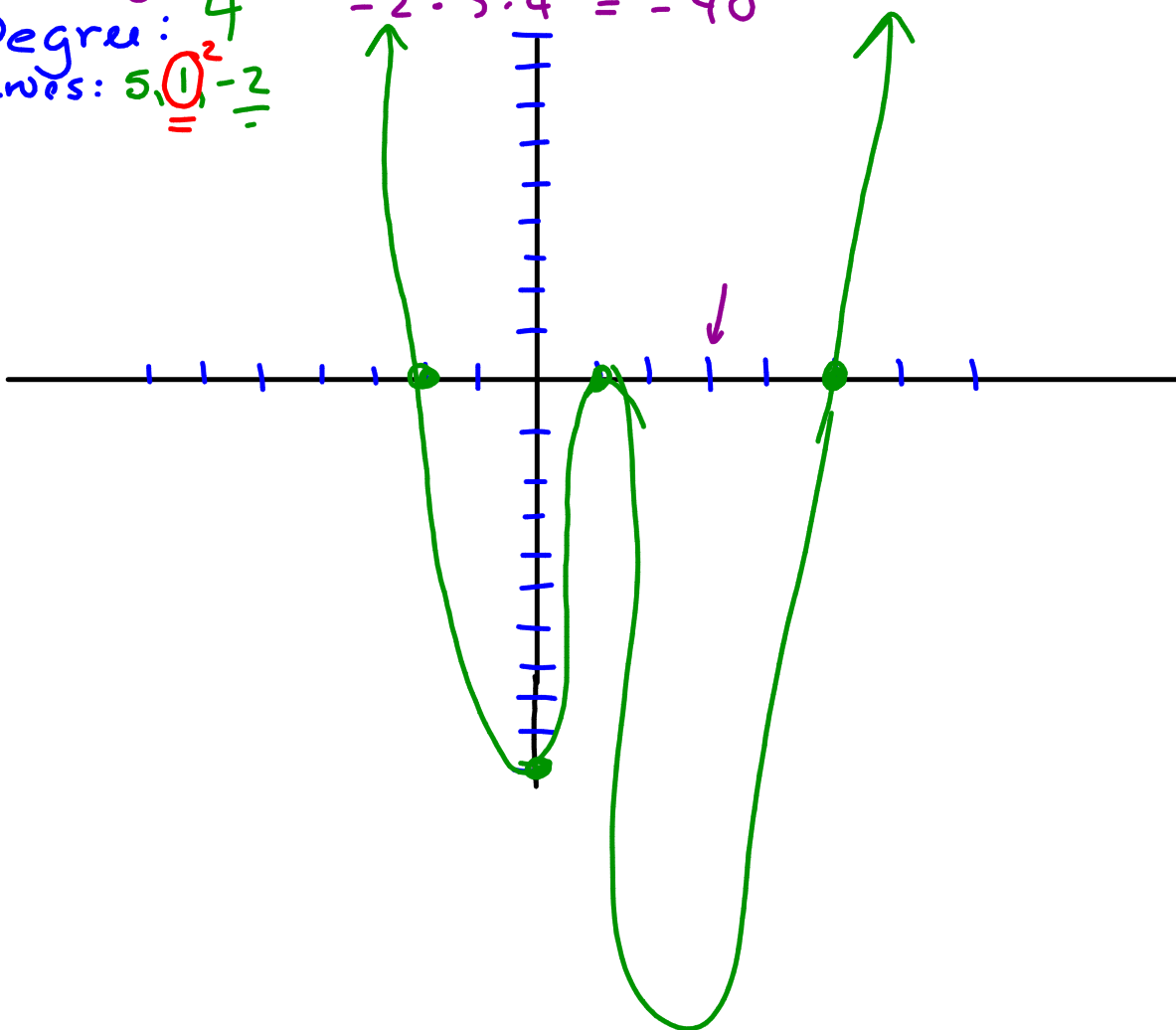
$x^6 \dots \dots \dots -500$

Sketch :

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

Degree: 4
 zeros: 5, 1, -2

$$-2 \cdot 5 \cdot 4 = -40$$



① Lowest possible degree? Even

$$f(x) = -(\underline{x+10})(x+2)(\underline{x-8})^2$$

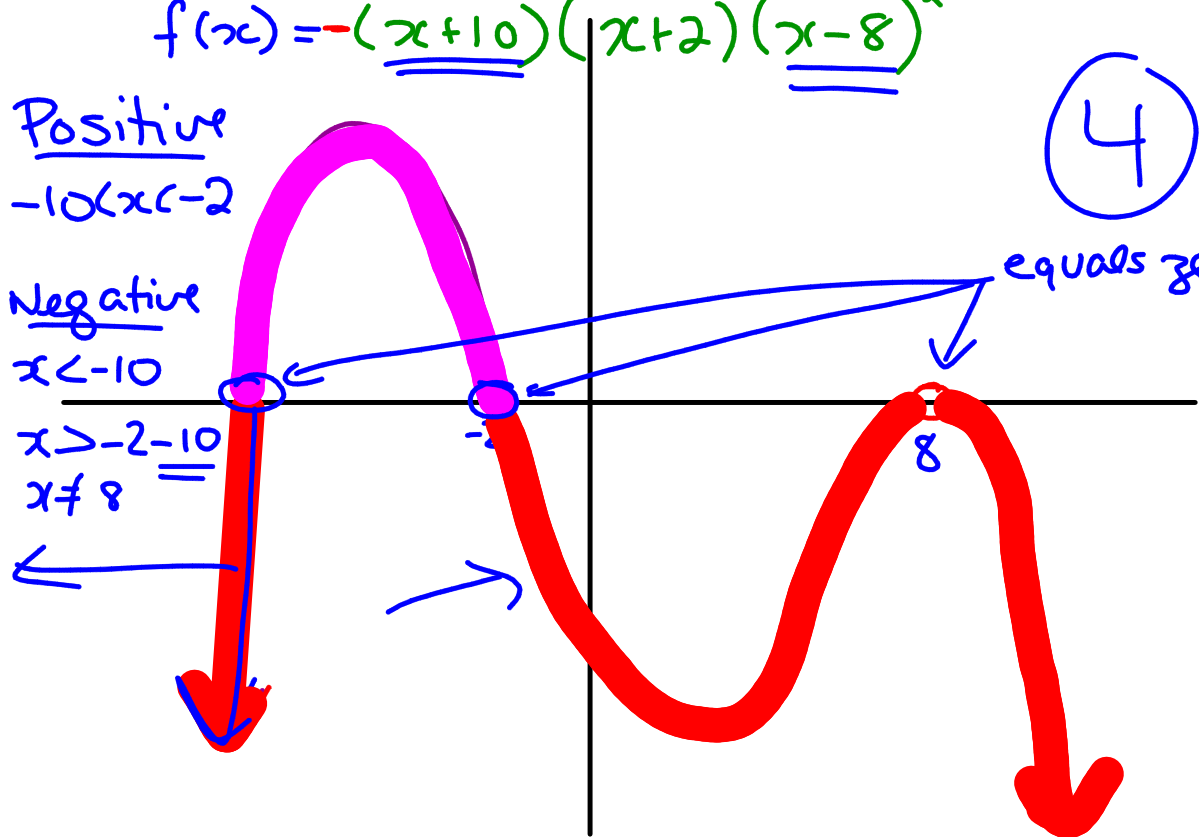
Positive
 $-10(x-2)$

Negative
 $x < -10$

$x > -2-10$
 $x \neq 8$

④

equals zero



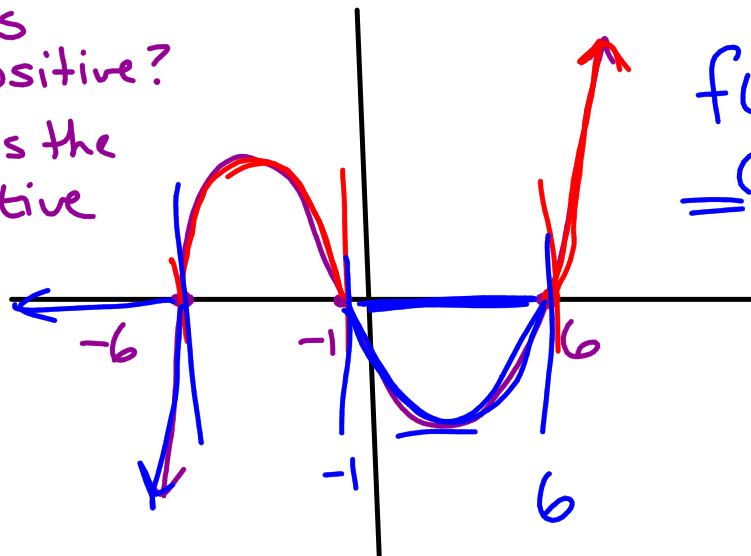
SOLVE

$$\underbrace{(x-3)^3}_{\uparrow} \underbrace{(x+2)}_{\downarrow \circ} \underbrace{(x-1)}_{\downarrow \circ} = 0$$

$x = -2, 1, 3$

$$x^4 - x^3 + 2x^2 + 5x - 3 = 0$$

- ① Where is the $f(x)$ positive?
- ② Where is the $f(x)$ negative?
- ③ What are the factors?



$$f(x) = (x+6)(x+1)(x-6)$$

factors

POSITIVE: $-6 < x < -1$
 $x > 6$

NEGATIVE: $x < -6$
 $-1 < x < 6$