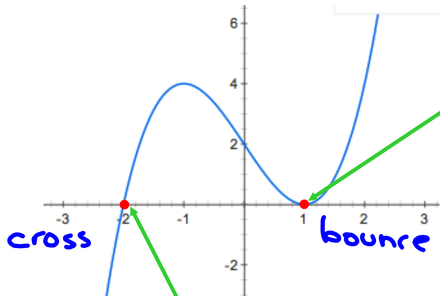
Graphing Polynomials

The **zeros** of any polynomial fuction y = f(x) correspond to the x-intercepts of the graph and the roots of the equation, f(x) = 0.

ex. f(x) = (x - 1)(x - 1)(x + 2)

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

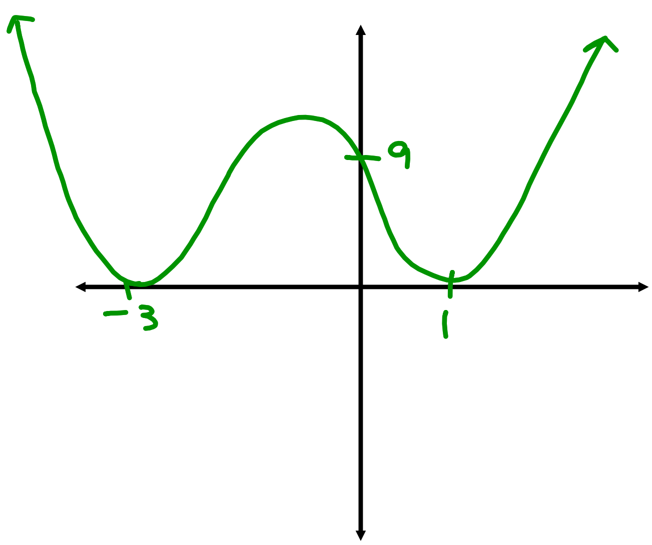
If a polynomial has a factor *x - a* that is repeated *n* times, then x = a is a **zero of multiplicity**, *n*. $f(x) = (x-1)^{2}(x+2)^{1}$



x = 1 (zero of even multiplicity)
sign of graph changes

x = -2 (zero of odd multiplicity)
sign of graph does not change

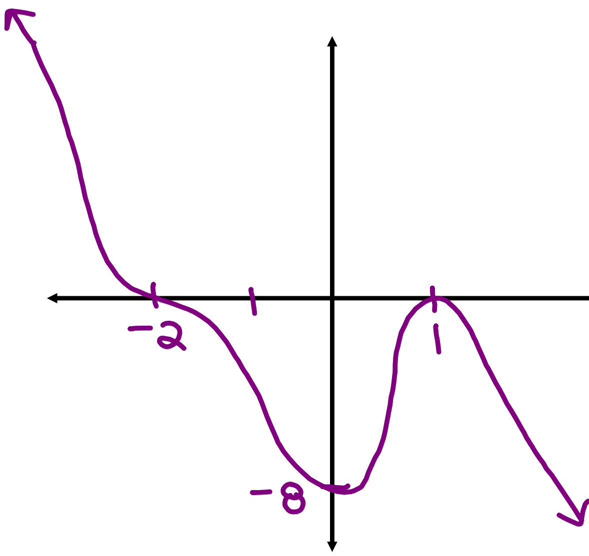
ex. Sketch the graph of
$f(x) = (x - 1)^2(x + 3)^2$



x-ints = 1, -3
Deg 4
L.C. +
y-int = 9

ex. Sketch the graph of

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



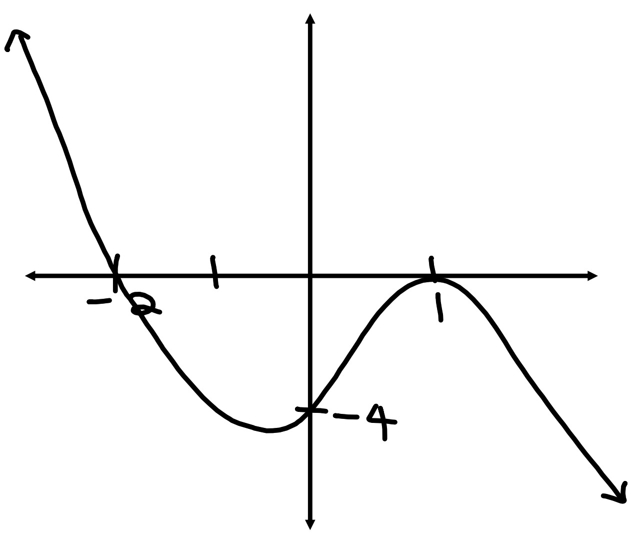
Deg 5
−LC

x-int = 1, −2

y-int = −8

ex. Sketch the graph of

$$p(x) = -2x^3 + 6x - 4$$



$p(1) = -2(1)^3 + 6(1) - 4$
$= -2 + 6 - 4$
$= 0$

$$\begin{array}{r|rrrr} 1 & -2 & 0 & 6 & -4 \\ & \downarrow & -2 & -2 & 4 \\ \hline & -2 & -2 & 4 & \underline{0} \end{array}$$

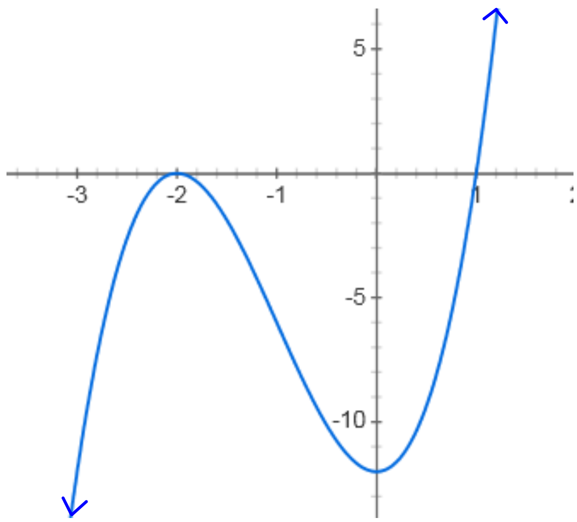
$p(x) = (-2x^2 - 2x + 4)(x - 1)$
$= -2(x^2 + x - 2)(x - 1)$
$= -2(x + 2)(x - 1)^2$

Deg 3
−LC

$x = -2, 1$

y-int = −4

Given each graph below, write the equation of the polynomial:



Deg 3

+ LC

x-ints = -2, 1

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

y-int = -12

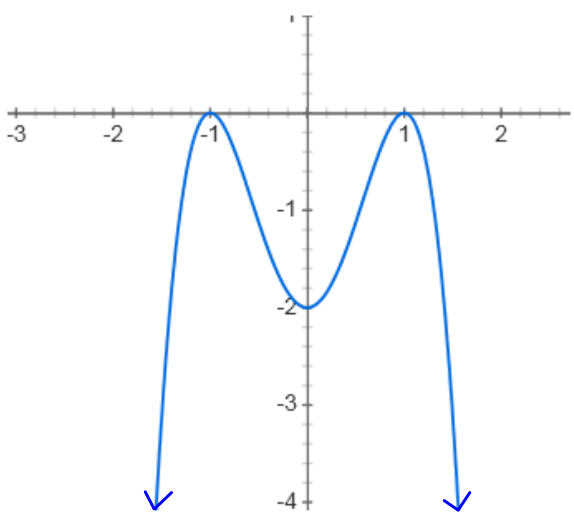
$f(x)=a(x+2)^2(x-1)$

$-12=a(0+2)^2(0-1)$

$-12=-4a$

$a=3$

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



Deg 4 − LC

x-ints = ±1

y-int = −2

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

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

$-2=a$

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