Zeros	Graph each function and find the zeros.

$f(x) = x^3 - 6x^2 + 9x$ $g(x) = x^4 - 10x^3 + 32x^2 - 38x + 25$

$h(x) = 4x^3 - 9x^2 - 10x + 3$ $p(x) = x^3 - 5x^2 - 8x + 12$

$f(x) = x^4 - 12x^3 + 19x^2 + 12x - 20$

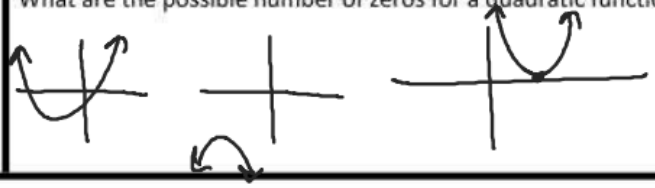
$t(x) = x^4 - 7x^3 + 17x^2 - 17x + 6$

$y = 4x$

What are the possible number of zeros for a linear function? $0 = 1$

0, 1

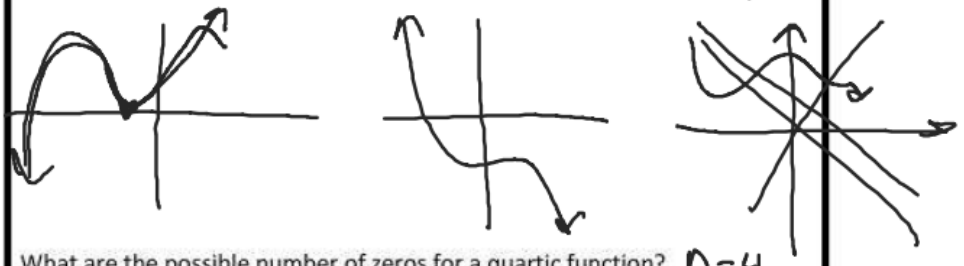
What are the possible number of zeros for a quadratic function? $0 = 2$



0, 1, 2

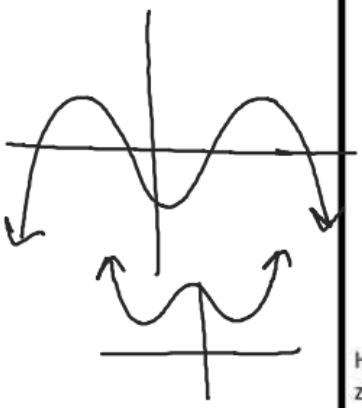
What are the possible number of zeros for a cubic function? D = 3

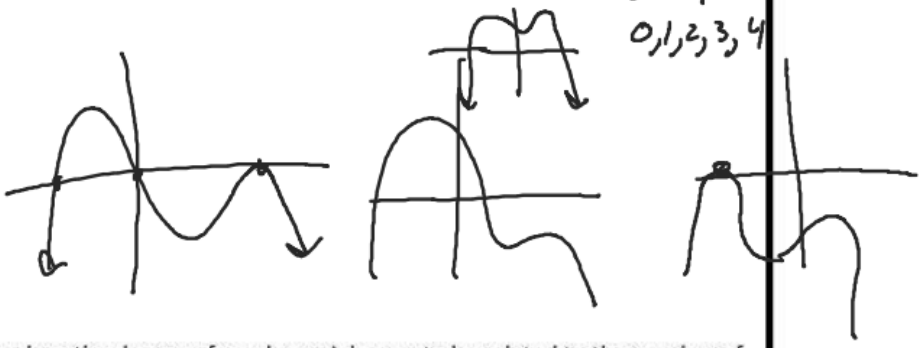
1, 2, 3



What are the possible number of zeros for a quartic function? D = 4

0, 1, 2, 3, 4



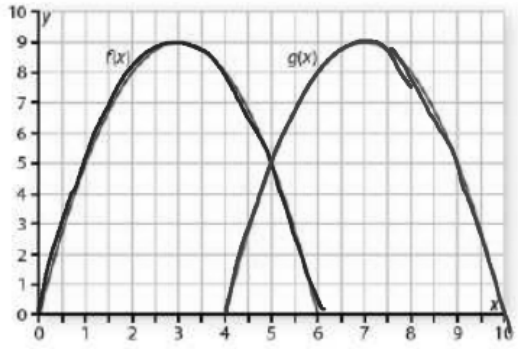


How does the degree of a polynomial seem to be related to the number of zeros of the related polynomial function?

Degree is max # of zeros.

The two parabolas that make up the "m" in the following diagram can be created by graphing $f(x) = -x^2 + 6x$ *and* $g(x) = -x^2 + 14x - 40$.

Zeros and Products of Polynomials



GCF

Standard Form

$y = ax^2 + bx + c$

Factored

$y = a(x-p)(x-q)$

FOIL

$a \cdot b = 0$

Write each equation in equivalent factored form.

Standard Form

$f(x) = -x^2 + 6x$

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

$g(x) = -x^2 + 14x - 40$

$g(x) = -(x^2 - 14x + 40)$

$-(x-10)(x-4)$ ← Factored form

For each function write the rule in both standard form and factored from.

$h(x) = x^2 + 4x$

$= x(x+4)$

$j(n) = -n^2 + n + 6$

$= -(n^2 - n - 6)$

$-(n-3)(n+2)$

-6

$-3 \cdot 2$

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

F L I O

$2x^2 + 10x - x - 5$

$2x^2 + 9x - 5$

Using the functions above, show how to use the factored form to find zeros of the function and x-intercepts of its graph.

$h(x) = x(x+4)$

$0 = x(x+4)$

$x = 0 \quad x+4 = 0$

$x = -4$

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

$2x - 1 = 0 \quad x + 5 = 0$

$+1 \quad +1$

$2x = 1 \quad y = -5$

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

$j(n) = -(n-3)(n+2)$

$0 = -(n-3)(n+2)$

$0 = (n-3)(n+2)$

$n - 3 = 0 \quad n + 2 = 0$

$n = 3 \quad n = -2$

$-\left(\frac{1}{2}-3\right)\left(\frac{1}{2}+2\right)$

$-(-2.5)(2.5)$

$(-2)^2+4(-2)$

$4+(-8)$

-4

Zeros $x=0,-4$

Zeros $x=\frac{1}{2},-5$

$(2(-2.25)-1)(-2.25+5)$

$y=ax^2+bx+c$

L.O.S. $x=\frac{-b}{2a}$

max/min $x=\frac{-b}{2a}$

Find y plug $\frac{-b}{2a}$ back into equation

y-intercept $(0,c)$

Using the same function, use the factored form and information about the x-intercepts to find the line of symmetry, the maximum or minimum point, and the y-intercept of the graph.

$h(x) = x(x+4)$

x^2+4x

$=0(0+4)$

$=0(4)$

0

L.O.S $x=-2$

min $(-2,-4)$

y-intercept $(0,0)$

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

$(2(0)-1)(0+5)$

$(-1)(5)$

L.O.S $x=-2.25$

min $(-2.25,-15.125)$

y-intercept $(0,-5)$

$j(n) = -(n-3)(n+2)$

$-(0-3)(0+2)$

$-(-3)(2)$

6

Use the standard form of the polynomial to locate the line of symmetry, maximum or minimum point, and y-intercept of the graph.

$h(x) = x^2+4x$

L.O.S. $x=-2$

min $(-2,-4)$

y-intercept $(0,0)$

$\frac{-b}{2a}$

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

$=-2$

$k(x) = 2x^2+9x-5$

$x=\frac{-b}{2a}$

$=\frac{-9}{2(2)}=\frac{-9}{4}$

$a=-1$ $b=1$ $c=6$

$j(n) = -n^2+n+6$

$-\left(\frac{1}{2}\right)^2+\frac{1}{2}+6$

$-\frac{1}{4}+\frac{1}{2}+6$

L.O.S $x=\frac{1}{2}$

max $\left(\frac{1}{2},6\frac{1}{4}\right) \rightarrow (.5,6.25)$

y-intercept $(0,6)$

Consider the function $q(x) = x(x-3)(x+5)$.

a. What are the zeros of $q(x)$?

b. Write the rule for $q(x)$ in standard form.

Zeros

$x=2,-2$

L.O.S.

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

max $\left(\frac{1}{2},\frac{25}{4}\right)$

$(.5,6.25)$

y-intercept $(0,6)$

$x=\frac{-b}{2a}=\frac{-1}{2(-1)}=\frac{1}{2}$