Addition, Subtraction, and Zeros	When a small music venue books a popular band business prospects of events depend on how the ticket sales are set. For example, if the ticket price at x dollars, income and expenses might be estimated as follows. Ticket sale income: $t(x) = -25x^2 + 750x$ Snack Bar Income: $s(x) = 7{,}500 - 250x$ Concert operating costs: $c(x) = 4{,}750 - 125x$ Snack bar operating costs: $b(x) = 2{,}250 - 75x$ Before the show the manager uses the functions *t(x)* and *s(x)* to estimate total income. a. What income should the manager expect from ticket sales alone if the ticket price is set at $12? What income from snack bar sales? What income from the two sources combine? $t(12) = -25(12)^2 + 750(12)$ $= \$5400$ $s(12) = 7500 - 250(12)$ $= \$4500$ $\$9900$ b. What rule would define the function *I(x)* that shows how combine income from ticket sales and snack bar sales depends on ticket price? Write a rule for *I(x)* in simplest standard form. $I(x) = t(x) + s(x)$ $= -25x^2 + 750x + 7500 - 250x$ $= -25x^2 + 500x + 7500$ c. What is the degree of *I(x)*? How does that compare to the degrees of *t(x)* and *s(x)*? Degree = 2
$t(x) = -25x^2 + 750x$	

$C(x) = 4750 - 125x$

$b(x) = 2250 - 75x$

The manager also uses the functions $c(x)$ and $b(x)$ to estimate total operating expenses.

a. What expenses should the manager expect from concert operations alone if the ticket price is set at \$12? What expense from snack bar operations? What expenses from the two sources combine?

$C(12) = 4750 - 125(12)$

$= \$3250$

$b(12) = 2250 - 75(12)$

$= \$1350$

$\$4600$

b. What rule would define the function $E(x)$ that shows how combine expense from concert and snack bar operations depends on ticket price? Write a rule for $E(x)$ that is in simplest standard form.

$E(x) = C(x) + b(x)$

$= 4750 - 125x + 2250 - 75x$

$= -200x + 7000$

c. What is the degree for $E(x)$? How does that compare to the degrees of $c(x)$ and $b(x)$?

Degree for $E(x) = 1$

Consider the next function $P(x)$ defined as $P(x) = I(x) - E(x)$.

a. What does $P(x)$ tell about the business prospects for the music venue?

$P(x) =$ Profit

b. Write two equivalent rules for $P(x)$.
   - One that shows the separation expressed for income and operating expenses
   - Another that is in simplest standard form

- $P(x) = (-25x^2 + 500x + 7500) - (-200x + 7000)$

$P(x) = -25x^2 + 700x + 500$

c. What is the degree for $P(x)$? How does that compare to the degrees of $I(x)$ and $E(x)$?

Degree of $P(x) = 2$

Find the sum and difference for each set of functions and give the degree in each case. Make sure your answer is in standard form.

a. $f(x) = 3x^3 + 5x - 7$ *and* $g(x) = 4x^3 - 2x^2 + 4x + 3$

$f(x)+g(x)$

$(3x^3+5x-7)+(4x^3-2x^2+4x+3)$

$7x^3-2x^2+9x-4$

D= 3

$f(x)-g(x)$

$(3x^3+5x-7)-(4x^3-2x^2+4x+3)$

$-x^3+2x^2+x-10$

D=3

b. $f(x) = 3x^3 + 4x^2 + 5$ *and* $g(x) = -3x^3 - 2x^2 + 5x$

$f(x)+g(x)$

$2x^2+5x+5$

D= 2

$f(x)-g(x)$

$6x^3+6x^2-5x+5$

D= 3

c. $f(x) = x^4 + 5x^3 - 7x + 5$ *and* $g(x) = 4x^3 - 2x^2 + 5x + 3$

$f(x)+g(x)$

$x^4+9x^3-2x^2-2x+8$

D=4

$f(x)-g(x)$

$x^4+x^3+2x^2-12x+2$

D=4

d. $f(x) = 6x^4 + 5x^3 - 7x + 5$ *and* $g(x) = 6x^4 + 5x$

$f(x)+g(x)$

$12x^4+5x^3-2x+5$

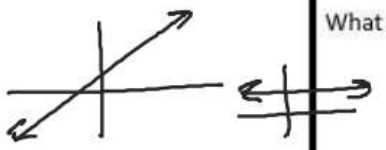
D=4

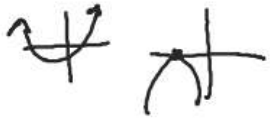
$f(x)-g(x)$

$5x^3-12x+5$

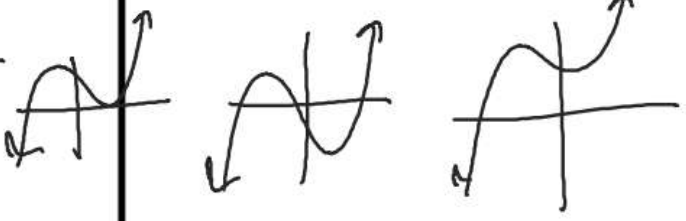
D=3

Zeros	Graph each function and find the zeros.
Where the graph intersects X-axis	$f(x) = x^3 - 6x^2 + 9x$ $x=0 \quad x=3$ $g(x) = x^4 - 10x^3 + 32x^2 - 38x + 25$ None $h(x) = 4x^3 - 9x^2 - 10x + 3$ $x = -1, \frac{1}{4}, 3$ $p(x) = x^3 - 5x^2 - 8x + 12$ $x = -2, 1, 6$ $f(x) = x^4 - 12x^3 + 19x^2 + 12x - 20$ $x = -1, 1, 2, 10$ $t(x) = x^4 - 7x^3 + 17x^2 - 17x + 6$ $x = 1, 2, 3$ What are the possible number of zeros for a linear function? 0, 1 or ∞ What are the possible number of zeros for a quadratic function? 0, 1, 2

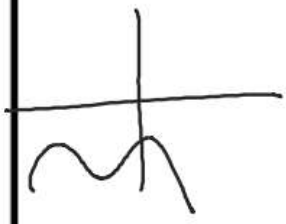




What are the possible number of zeros for a cubic function?



1, 2, 3



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

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?

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