

Writing Polynomial Functions for a set of Points

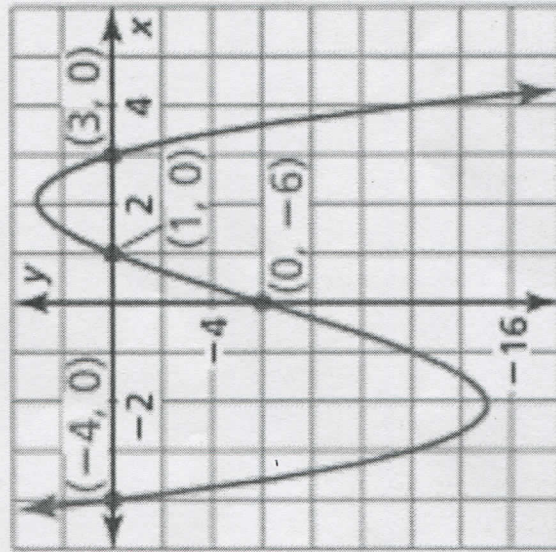
Use factors and another point to find your "a"

STEPS:

- 1) Use factored form: $y = a(x - r_1)(x - r_2)(x - r_3)$
- 2) replace the roots with their value of what $x =$
- 3) Use a coordinate (preferably the y -intercept) and replace your x 's and y in the formula
- 4) solve for "a" the only missing variable in the original factored form
- 5) rewrite the original formula with the a and r values replaced

TASK 1: Write the polynomial function for the graph or coordinate provided.

a)



$$x = -4, 1, 3$$

$$(x, y) = (0, -6)$$

$$y = a(x - r_1)(x - r_2)(x - r_3)$$

$$-6 = a(0 + 4)(0 - 1)(0 - 3)$$

$$-6 = a(4)(-1)(-3)$$

$$\frac{-6}{12} = \frac{12a}{12}$$

$$a = -\frac{1}{2}$$

$$f(x) = -\frac{1}{2}(x + 4)(x - 1)(x - 3)$$

b) x, y

$$(-4, 0), (0, 10), (2, 0), (5, 0)$$

$$10 = a(0 + 4)(0 - 2)(0 - 5)$$

$$10 = a(4)(-2)(-5)$$

$$\frac{10}{40} = \frac{40a}{40}$$

$$\frac{1}{4} = a$$

$$g(x) = \frac{1}{4}(x + 4)(x - 2)(x - 5)$$

$$g(x) = \frac{1}{4}(x + 4)(x - 2)(x - 5)$$

Finite Differences

The number of times you need to subtract the y -values before they are all constant. For Linear functions from Algebra 1, you subtracted the y -values ONCE to find the slope, Quadratics you subtracted twice, because it is the same as the degree.

Finite Difference of Polynomials

Function Type	Degree	Constant Finite Differences
Linear	1	First
Quadratic	2	Second
Cubic	3	Third
Quartic	4	Fourth
Quintic	5	Fifth

TASK 2: Use finite differences to determine the degree of the polynomial that best describes the data provided.

a) Cubic
D: 3

x	4	6	8	10	12	14
y	-2	4.3	8.3	10.5	11.4	11.5

-0.5

b) no constant

Year	1994	1995	1996	1997	2000	2001	2003	2004
Price (\$)	774	751	1053	1293	4186	2474	1347	2011

Creating a Model for a set of Data

Once you know the degree, from doing the finite difference, use that information to choose the correct function type on your calculator. ie: degree 2, QuadReg or degree 4, QuartReg

TASK 3: Write a polynomial function for the data provided. Show finite differences to prove your degree. Then use your function to answer the question

a) Find $x = 21$. $f(x) = 0.30x^4 + 0.848x^3 - 9.1667x^2 + 26.944x + 4.571$ $f(21) = 64,504.876$

Quartic
D: 4

x	1	2	3	4	5	6	7
f(x)	20	14	4	0	-4	-12	-24

b) Is your model reasonable for the 13 seconds?

Seconds	1	2	3	4	5	6	7
Height (in)	0.5	-2.5	3	-3.5	2	-1	-1

$h(x) = 0.167x^3 - 0.5x^2 + 2.833x - 2$

Still need help with:

$h(13) = 317.228$