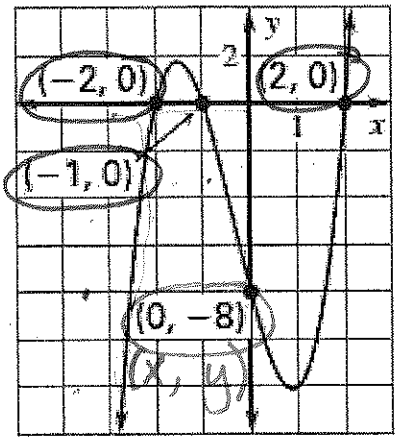
Learning Target(s): I am able to write the equation of a higher-degree polynomial function given points that lie on the function. I am able to use a graphing calculator to find a polynomial function that fits given data points.

Notes: 5.9 Write Polynomial Functions and Models

Ex 1: Write the cubic function whose graph is shown.

$f(x) = a(x-k_1)(x-k_2)(x-k_3)$



Step 1: Use the 3 x-intercepts

to write the function in intercept form.

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

Step 2: Find a by substituting the coordinates of the fourth point.

$-8 = a(0+2)(0+1)(0-2)$

$-8 = a(2)(1)(-2) \rightarrow \frac{-8}{-4} = \frac{a(-4)}{-4}$

****Check the end behavior of f.**

The degree is 3 and the leading coefficient is 2 so $a = 2$

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

As $x \rightarrow -\infty$ $f(x) \rightarrow -\infty$ and

As $x \rightarrow +\infty$ $f(x) \rightarrow +\infty$, which matches with the graph.

Try it!

1. Write the cubic function whose graph is shown.

$y = a(x+3)(x-1)(x-4)$

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

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

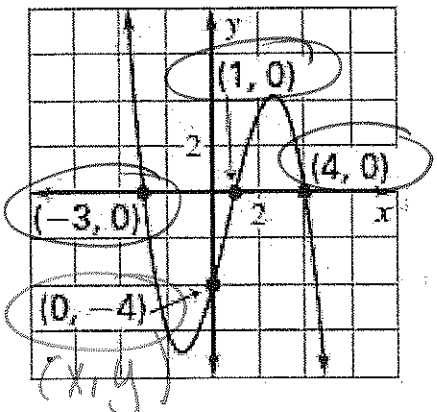
$\frac{-4}{12} = \frac{a(12)}{12}$

$-\frac{1}{3} = a$

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

$x+3=0$

$x=-3$



x^3 odd

lc: −

Ex. 2

The table shows the percent enrollment rate r in preprimary schools from years 1970 to 2000.

L_1 X

L_2 Y

Years since 1970, t	0	5	10	15	20	25	30
Enrollment rate, r	37.5	48.6	52.5	54.6	59.4	61.8	64

a. Use a graphing calculator to find a polynomial model for the data.

① STAT → Edit → L_1 (X) | L_2 (y)

② Graph → statplot on → ZOOM → zoomstat

③ STAT → CALC → cubic reg.

b. What was the preprimary school enrollment rate in 2005? → 35 years

$y = .0014x^3 + -.0862x^2 + 2.1825x + 38.131$

Type in ↗ y=

Table: X | y

35 | 68.949 rate

Try it!

Space Exploration The table shows the average speed y (in feet per second) of a space shuttle for different times t (in seconds) after launch.

t	10	20	30	40	50	60	70	80
y	202.4	463.4	748.2	979.3	1186.3	1421.3	1795.4	2283.5

a. Use a graphing calculator to find a polynomial model for the data.

b. When the space shuttle reaches a speed of approximately 4400 feet per second, its booster rockets fall off. Use the model from part (a) to determine how long after launch this happens.