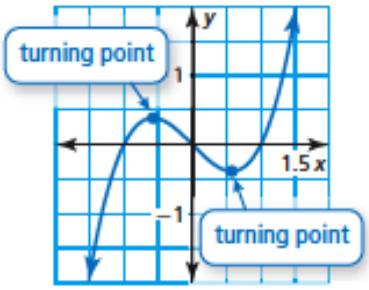
Algebra 2
147

A ***turning point*** of the graph of a polynomial function is a point on the graph at which the function changes from

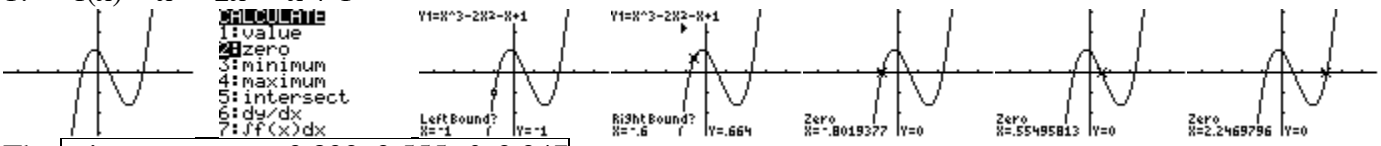
- increasing to decreasing, or
- decreasing to increasing.

Other expressions for "Turning Point" are "Relative Maximum/Minimum" and "Local Maximum/Minimum".

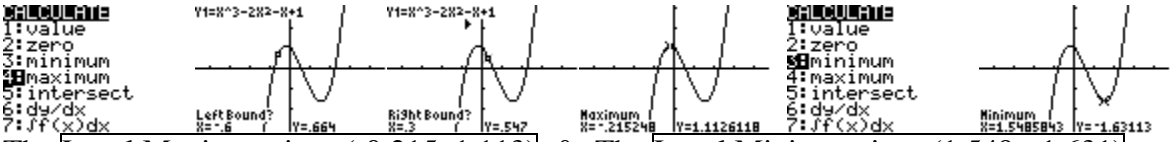


Use a graphing calculator to graph the following, then use the calculate function to find the x-intercept(s) and the turning points.

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



The x-intercepts are: -0.802, 0.555, & 2.247



The Local Maximum is at (-0.215, 1.113) & The Local Minimum is at (1.549, -1.631)

2. The graph of every polynomial function of degree *n* has at most (*n* – *1*) turning points.

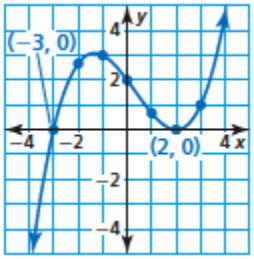
3. Using x-intercepts, graph $f(x) = \frac{1}{6}(x+3)(x-2)^2$

Plot the x-intercepts because -3 and 2 are zeros and (-3, 0) & (2, 0) are the x-intercepts.
Make a table of points between and beyond the x-intercepts

x	-2	-1	0	1	3
y	$\frac{8}{3}$	3	2	$\frac{2}{3}$	1

The End Behavior: As $x \to -\infty$, $f(x) \to -\infty$ & As $x \to \infty$, $f(x) \to \infty$

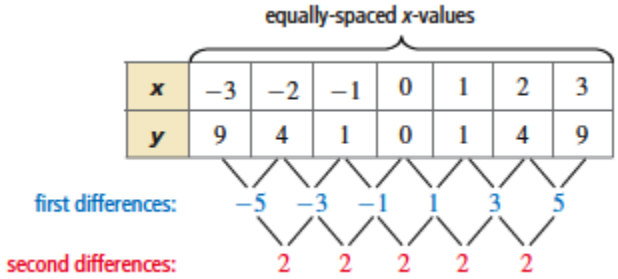
Draw the Graph



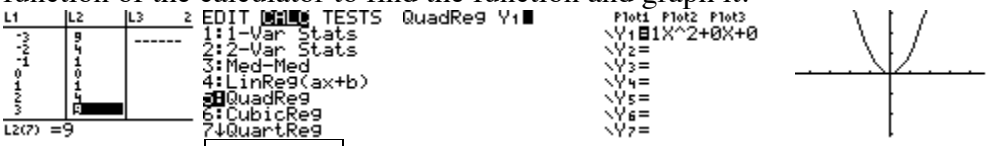
If f(x) = f(-x), then f(x) is an **Even Function**.
Even functions are reflections of themselves about the y-axis.
When a polynomial function has only even degree terms, it is an even function.

If f(x) = -f(-x), then f(x) is an **Odd Function**.
Odd functions are reflections of themselves about the origin.
When a polynomial function has only odd degree terms, it is an odd function.

Recall that when the x-values in a data set are equally spaced, the differences of consecutive y-values are called **finite differences**. When the finite ^{n} differences are the same, the data is a n^{th} degree polynomial.

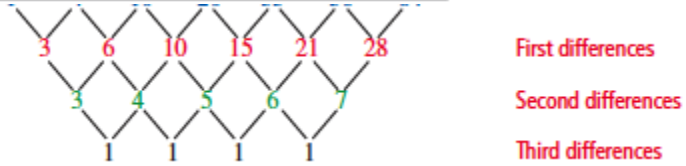


The data represents a 2nd degree or quadratic polynomial function. We can use the Stat function and Regression function of the calculator to find the function and graph it.

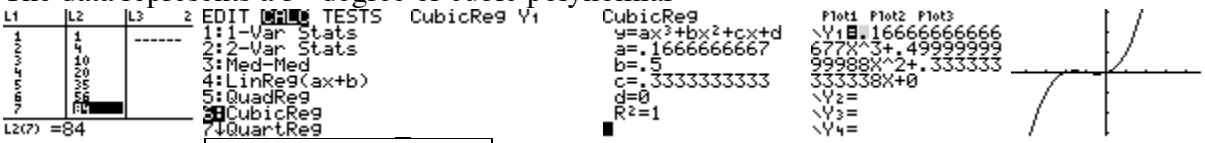


The function is $\boxed{f(x) = x^2}$

x	1	2	3	4	5	6	7
f(x)	1	4	10	20	35	56	84



The data represents a 3rd degree or cubic polynomial

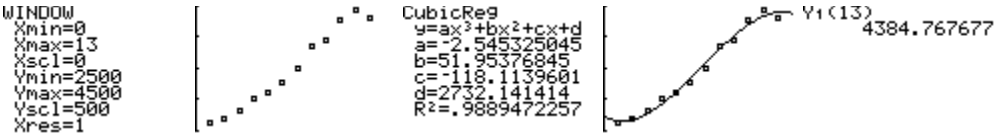


The function is $\boxed{f(x) = \frac{1}{6}x^3 + \frac{1}{2}x + \frac{1}{3}}$

In many real-life situations, you cannot find models to fit data exactly. Despite this limitation, we can still use technology to approximate the data with a polynomial model, as shown in the next example.

The table shows the total U.S. biomass energy consumptions y (in trillions of British thermal units, or BTUS) in the year t, where t = 1 corresponds to 2001. Find a polynomial model for the data. Use the model to estimate the total U.S. biomass energy consumption in 2013.

x	1	2	3	4	5	6	7	8	9	10	11	12
y	2622	2701	2807	3010	3117	3267	3493	3866	3951	4286	4421	4316

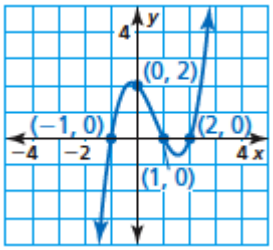


The estimate of total biomass energy consumption in 2013 is about 4385 BTUS.

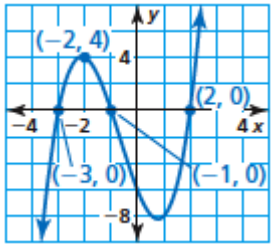
Algebra 2 Assignment 147 Tuesday December 15 2015 Hour Name

Write the function for the following graphs in the form of a constant multiplied by factors representing zeros.

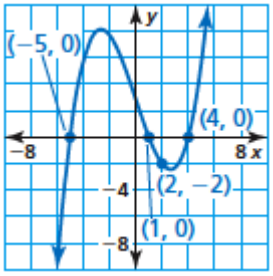
1.



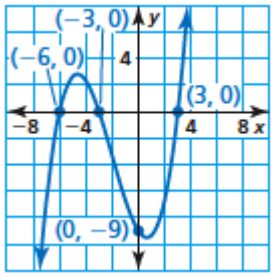
2.



3.



4.



Write the polynomial that fits the data:

5.

x	−1	0	1	2	3	4
f(x)	−14	−5	−2	7	34	91

6. (-4, -317), (-3, -37), (-2, 21), (-1, 7), (0, -1), (1, 3), (2, -47), (3, -289), (4, -933)

7. $f(x) = 5x^3 - 38x^2 - 19x + 10$ Find $f(8)$

8. Write the End Behavior for $f(x) = -4x^4 + 5x^3 - 4x^2 + 10x - 1$

9. List the Rational Candidates for zeros: $f(x) = 2x^3 - 3x^2 + 2x - 6$

10. $f(x) = 3x^5 - 2x^3 + x$ $f(x)$ is what kind of Function? An Even function, An Odd function, or Neither

11. Completely Factor the polynomial: $3x^5 - 24x^2y^3$

12. Write a polynomial function of minimum degree with the following zeros: $5,\ 3-\sqrt{2}$

13. Expand: $(3x-2)^4$

14. Use consecutive differences to find the degree, then write the polynomial

x	-2	-1	0	1	2	3	4
y	-10	2	4	2	2	10	32

15. $(x^6-4)(x^2-7x+5) =$

16. $(3x^4-2x^3-x-1)\div(x^2-2x+1) =$

17. $(2x^3-3x^2+5x-1)\div(x+2) =$