Warm-up

Saturday, October 4, 2014

1. Find all solutions of $f(x)=2x^3 - 54$.

2. Find all solutions of $f(x)=8x^3 + 125$.

10
9
8
7
6
5
4
3
2
1

Objectives

Model Real World Situations with Polynomial Models

Make predictions using Polynomial Models

Homework

Handout, page 73 1 -8 odd, 9-12 and 15-18

Check your homework

2. $(5 + a)^6$
$15{,}625 + 18750a + 9375a^2 + 2500a^3 + 375a^4 + 30a^5 + a^6$

3. $(y + 1)^4$
$y^4 + 4y^3 + 6y^2 + 4y + 1$

4. $(3a + 2)^4$
$81a^4 + 216a^3 + 216a^2 + 96a + 16$

5. $(x - 3)^5$
$x^5 - 15x^4 + 90x^3 - 270x^2 + 405x - 243$

6. $(b + 1)^8$
$b^8 + 8b^7 + 28b^6 + 56b^5 + 70b^4 + 56b^3 + 28b^2 + 8b + 1$

7. $(x + 2)^3$
$x^3 + 6x^2 + 12x + 8$

Find the specified term of each binomial expansion.

8. second term of $(x - 4)^8$
$-32x^7$

9. third term of $(x + 3)^{12}$
$594x^{10}$

10. fourth term of $(x - 2)^7$
$-280x^4$

11. third term of $(x^2 - 2y)^6$
$60x^8y^2$

12. fifth term of $(3x - 1)^5$
$15x$

13. seventh term of $(x - 4y)^6$
$4096y^6$

18. $(2a + b)^7$
8; $128a^7 + 448a^6b$

19. $(c - d)^8$
9; $c^8 - 8c^7d$

20. $(x + y)^3$
4; $x^3 + 3x^2y$

21. $(3x - y)^5$
6; $243x^5 - 405x^4y$

22. $(x + y^2)^5$
6; $x^5 + 5x^4y^2$

23. $(4 - 2x)^7$
8; $16{,}384 - 57{,}344x$

Check your homework

Find the real or imaginary solutions of each equation by factoring.

1. $8x^3 - 27 = 0$
   $(2x - 3)(4x^2 + 6x + 9)$; $\frac{3}{2}, \frac{-3 \pm 3i\sqrt{3}}{4}$

2. $x^3 + 64 = 0$
   $(x + 4)(x^2 - 4x + 16)$; $-4, 2 \pm 2i\sqrt{3}$

3. $2x^3 + 54 = 0$
   $2(x + 3)(x^2 - 3x + 9)$; $-3, \frac{3 \pm 3i\sqrt{3}}{2}$

4. $2x^3 - 250 = 0$
   $2(x - 5)(x^2 + 5x + 25)$; $5, \frac{-5 \pm 5i\sqrt{3}}{2}$

5. $4x^3 - 32 = 0$
   $4(x - 2)(x^2 + 2x + 4)$; $2, -1 \pm i\sqrt{3}$

6. $27x^3 + 1 = 0$
   $(3x + 1)(9x^2 - 3x + 1)$; $-\frac{1}{3}, \frac{1 \pm i\sqrt{3}}{6}$

7. $64x^3 - 1 = 0$
   $(4x - 1)(16x^2 + 4x + 1)$; $\frac{1}{4}, \frac{-1 \pm i\sqrt{3}}{8}$

8. $x^3 - 27 = 0$
   $(x - 3)(x^2 + 3x + 9)$; $3, \frac{-3 \pm 3i\sqrt{3}}{2}$

Check your homework

1. $(4, -1)$ and $(-3, 13)$
   $y = -2x + 7$

2. $\left(1, -\frac{9}{2}\right)$ and $(6, -2)$
   $y = \frac{1}{2}x - 5$

3. $(7, -5)$ and $(-1, 3)$
   $y = -x + 2$

4. $(0, -3)$, $(-2, -7)$, and $(2, 9)$
   $y = x^2 + 4x - 3$

5. $(-3, 15)$, $(1, 11)$, and $(0, 6)$
   $y = 2x^2 + 3x + 6$

6. $(-2, -12)$, $(1, -6)$, and $(2, -24)$
   $y = -5x^2 - 3x + 2$

7. $(4, -1)$, $(-2, -13)$, and $(1, 2)$
   $y = -x^2 + 4x - 1$

8. $(0, 9)$, $(2, 21)$ $(-1, 0)$, and $(3, 36)$
   $y = x^3 - 2x^2 + 6x + 9$

5-8 Practice
Page 73-73

Check your homework

9. Let x = the number of years after 1985.

World Gold

Year	Production (millions of troy ounces)
1985	49.3
1990	70.2
1995	71.8
2000	82.6

SOURCES: *The World Almanac* and *World Gold*

$f(x) = 0.038x^3 - 0.956x^2 + 8.01x + 49.3$

10. Let x = the number of years after 1970.

Life Expectancy

Year of Birth	Female (years)
1970	74.7
1980	77.4
1990	78.8
2000	79.7

SOURCE: U.S. Bureau of the Census

$f(x) = 0.00013x^3 - 0.0105x^2 + 0.3617x + 74.7$

11. Let x = the number of years after 1985.

U.S. Energy

Year	Total Production ($\times 10^{15}$ Btu)
1985	64.9
1990	70.8
1995	71.0

SOURCE: Energy Information Administration

$f(x) = -0.114x^2 + 1.75x + 64.9$

12. Let x = the number of years after 1980.

Social Security Benefits

Year	Monthly Average (dollars)
1980	321.10
1990	550.50
2000	844.60

SOURCE: *www.infoplease.com*

$f(x) = 0.3235x^2 + 19.705x + 321.1$

Check your homework

15. Estimate world gold production for 2010, 2020, and 2025.
    245.8 troy oz., 787.8 troy oz., 1272.1 troy oz.

16. Estimate the life expectancy for women born in 1986, 1992, and 2005.
    78.3 years, 79.0 years, 80.1 years

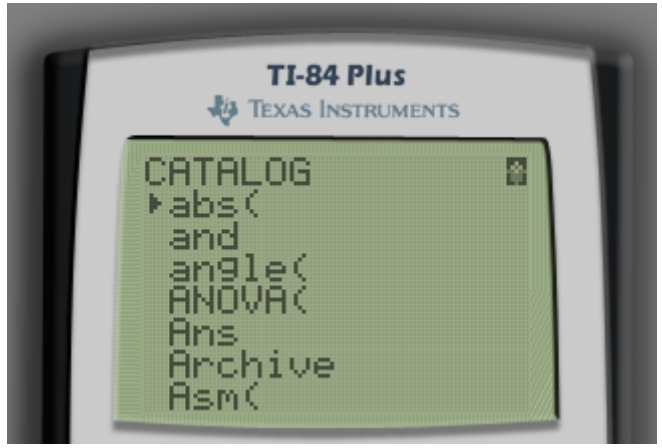
17. Estimate the U.S. energy production for 2002, 2005, and 2010.
    61.7×10^{15} Btu, 54.3×10^{15} Btu, 37.4×10^{15} Btu

18. Estimate the average monthly Social Security benefits for 1970, 1996, and 1999.
    $156.40, $719.20, $812.28

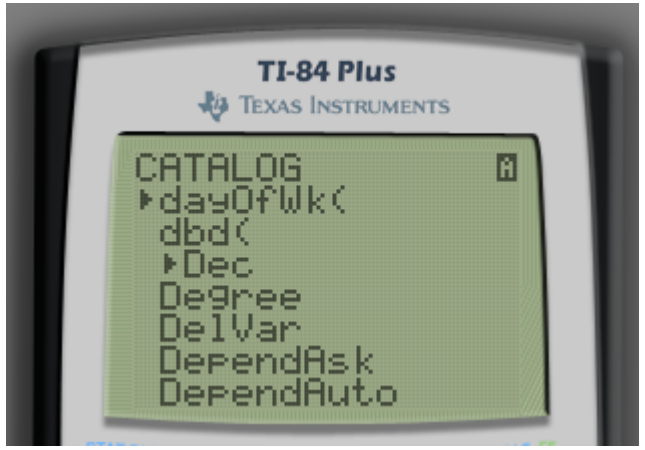
Schedule for Monday, October 6th

7:15 – 11:30	Homeroom 9th grade: COPS 10th grade: ACT Plan 11th grade: Mock ACT 12th grade: College/Career Planning
11:30-11:36	Transition to 1st block
11:36-1:02	1st block 12:01-1:02 - A lunch class 11:30-11:55 - A lunch 11:36-12:05; 12:34-1:02 - B lunch class 12:05-12:29 - B lunch 11:36-12:37 - C lunch class 12:37-1:02 - C lunch
1:02-1:08	Transition to 2nd block
1:08-2:10	2nd block
2:10-2:15	Announcements

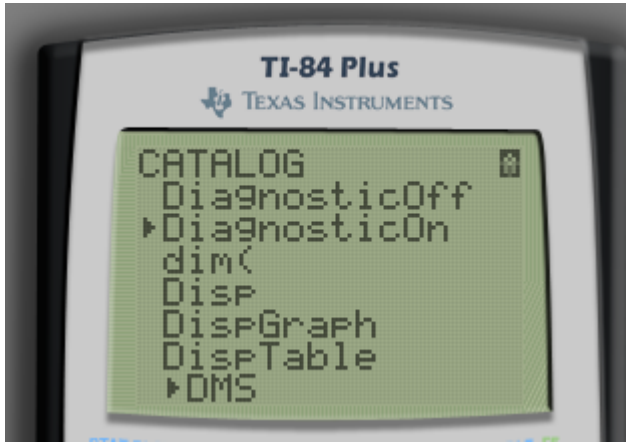
Before we start, we need to make sure you have diagnostics set to on…



2nd 0

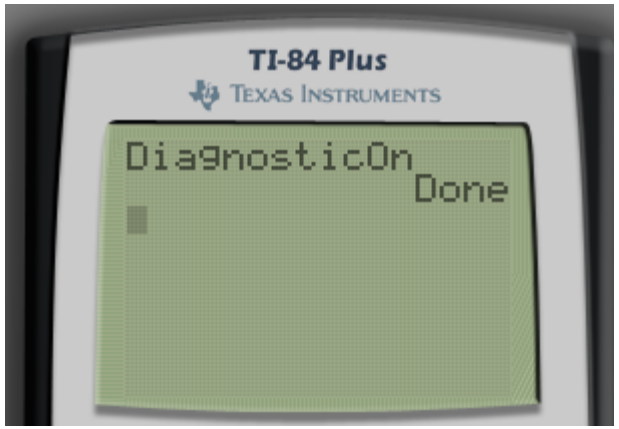


ALPHA x^{-1}



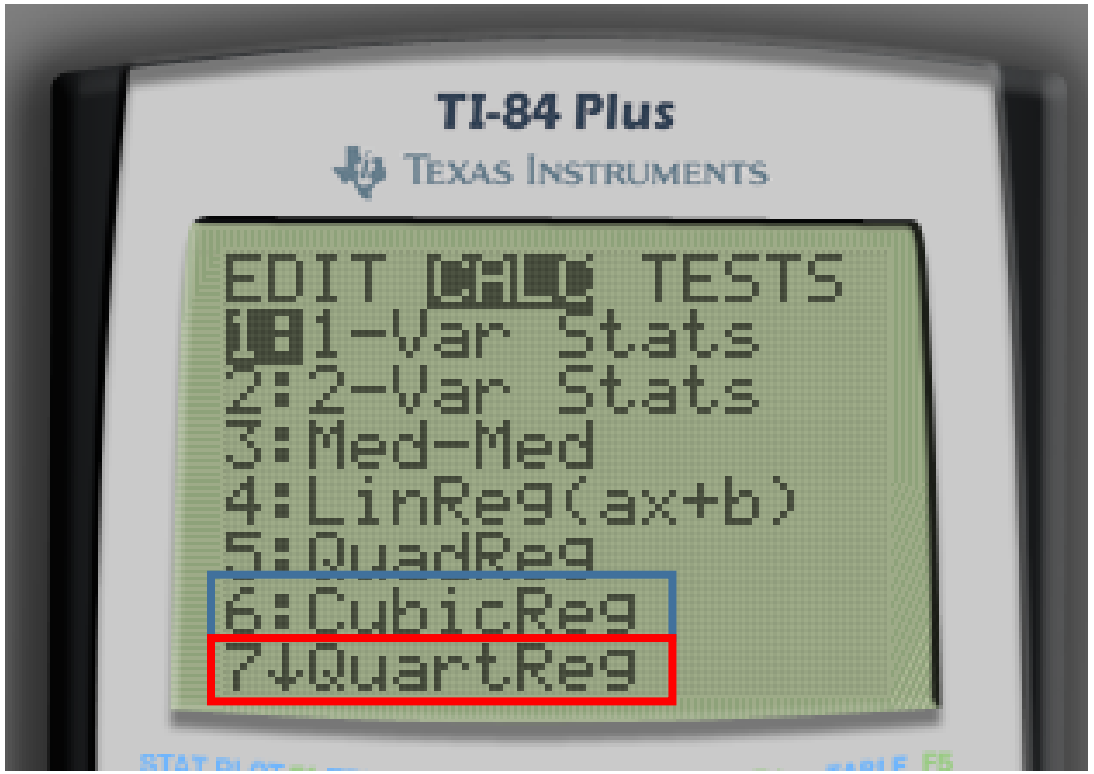
Down Arrow until you see DiagnosticOn

Press Enter twice



We've used linear and quadratic regressions before. Today we'll look at other types of modeling. Depending on the type of data a Cubic or Quartic model works better.

Stat Calc

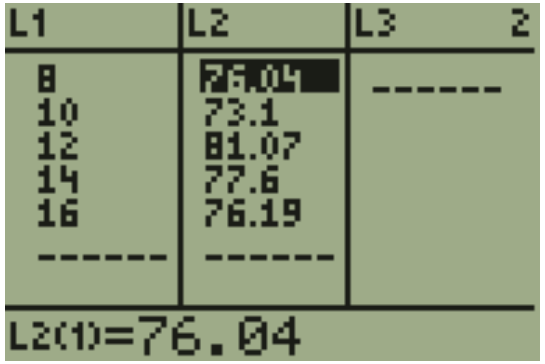


We're working from the handout, page 72.

We have some data about flight arrivals. We need to find a model for the data which can help us make predictions.

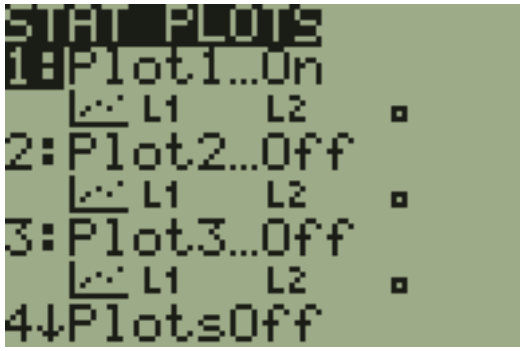
First enter your data…

STAT, EDIT



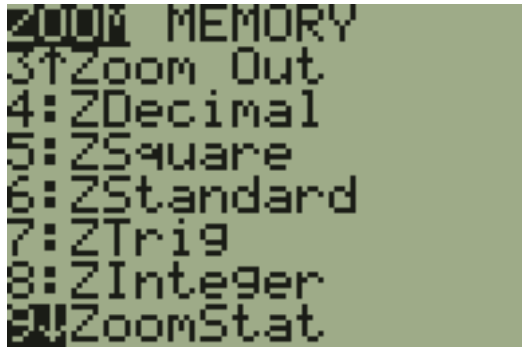
Now create a scatter plot of the data.

2^{nd} y=

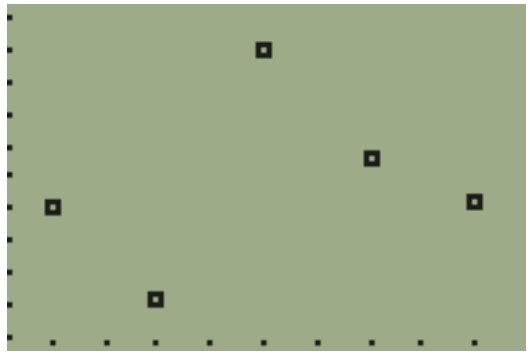


Highlight On

ZOOM 9



GRAPH

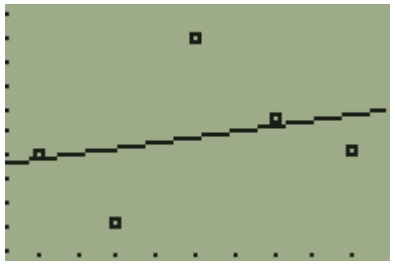


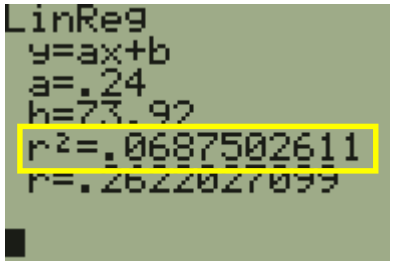
Now we need to find the model of best fit.

We need to look at the R^2 values

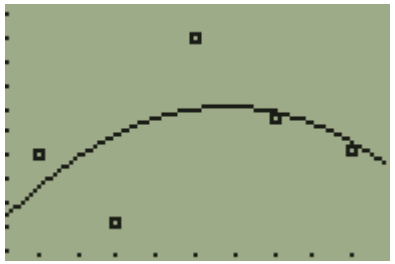
The closer R^2 is to 1 the stronger the model.

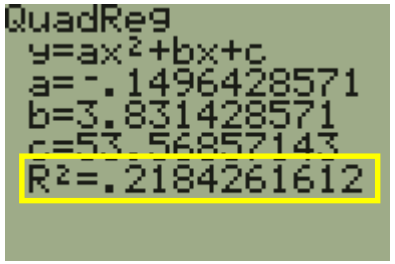
Linear



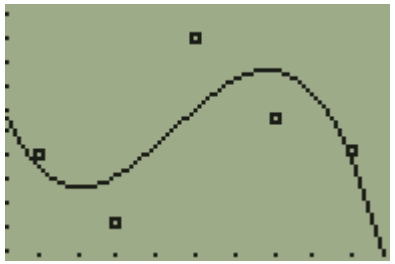


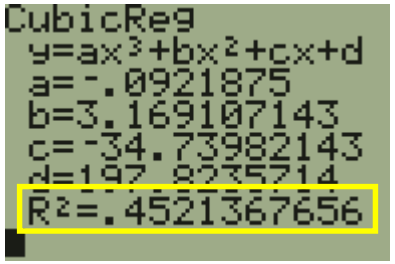
Quadratic



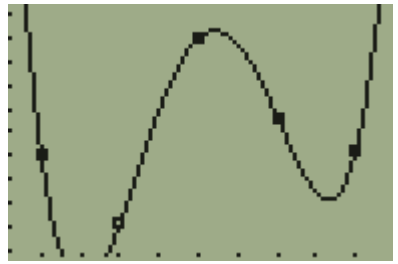


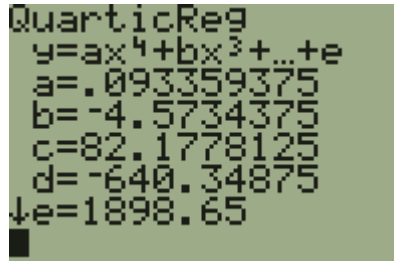
Cubic

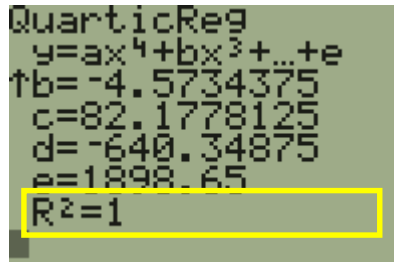




Quartic



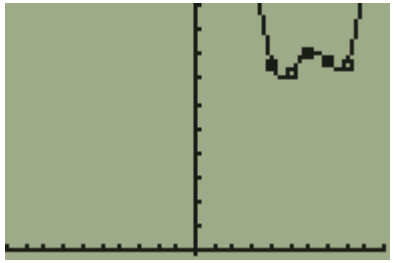


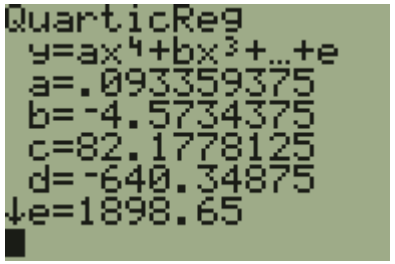


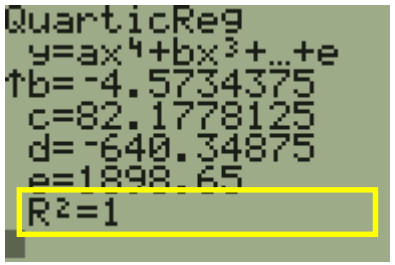
So Quartic it appears the best model for this collection of data.

Let's use the quartic model to make some predictions

Quartic

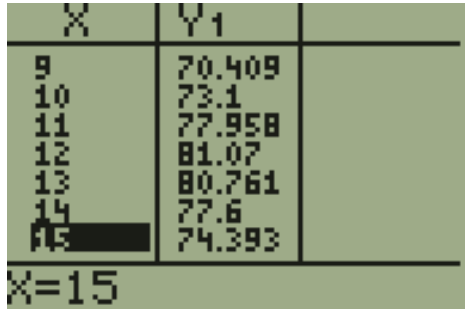






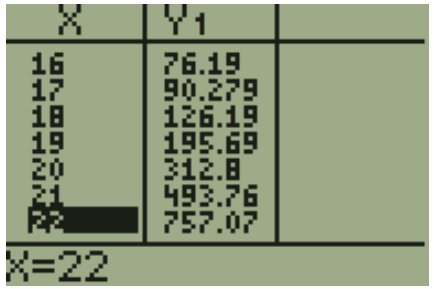
What percentage of flights were on-time in the year 2005?

Remember x represents years since 1990.



74.4%

What percentage of flights were on-time in the year 2012?



Is this realistic? **757%**

Not really. Since we only have a small number of data points, we can't get too far outside of the range of data we have.

You may now work with a partner on the handout.

Save yourself some time!

Do 9 and 15 together

Do 10 and 16 together

Do 11 and 17 together

Do 12 and 18 together