# Warm up:

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

$+0x^2$

| 1 | 1 | 2 | 0 | 1 | −3 |
|---|---|---|---|---|---|
| | | 1 | 3 | 3 | 4 |
| | 1 | 3 | 3 | 4 | 1 |

$x^3 + 3x^2 + 3x + 4$ r 1

2. $(6x^3 + 2x^2 - 11x + 12) \div (3x + 4)$

$2x^2 - 2x - 1$ r 16

$3x+4 \overline{)\,6x^3 + 2x^2 - 11x + 12}$

$-(6x^3 + 8x^2)$

$-6x^2 - 11x$

$-(-6x^2 - 8x)$

$-3x + 12$

$-(-3x - 4)$

$16$

Mon. Sept. 6

Objective: SWBAT model data by using quadratic functions

EQ: How do we decide if a model is good enough?

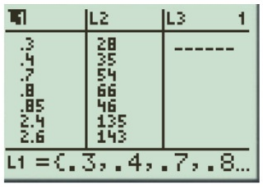
Agenda:

- Warm Up
- HW huddle
- Notes
- Practice
- Reflection

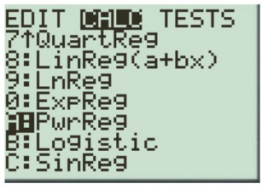
HW: Unfinished Problems

# Notes: Regressions

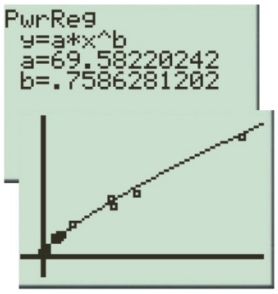
A regression is a function that is fitted to some data so that we can make predictions about other events.




As long as you have data in lists, the calculator will do regressions. We're interested in the linear (#4) through quartic (#7) and the power regression.




Stat Diagnostics (Mode menu): $R^2$ is an estimate of how good the model is




The annual savings as a percent of disposable income in the US is given below. What year was the annual savings at 6.5%?

| Year | 1970 | 1980 | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|
| % Savings | 9.4 | 10.0 | 7.0 | 4.6 | 2.3 | 1.8 | 2.4 | 2.1 | 2.0 | −0.4 |

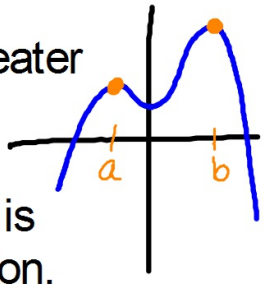
**Source:** U.S. Department of Commerce

year 1991

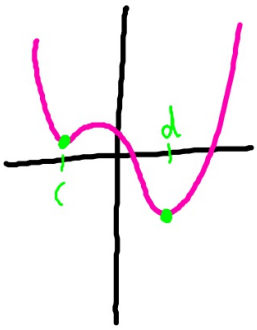
# Notes: Maximum and Minimum

For a function f(x),

- a point at x = a is a local maximum if f(a) is greater than the points around it.



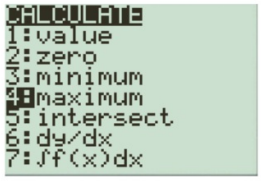

- a point at x = b is an absolute maximum if f(b) is greater than all of the other points in the function.
- a point at x = c is a local minimum if f(c) is less than the points around it.



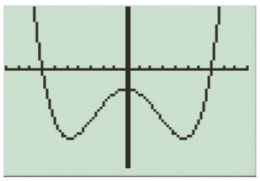

- a point at x = d is an absolute minimum if f(d) is less than all of the other points in the function.

# Notes: Finding Max/Min

Use the calculate menu in the TI-84. Remember to put your guess inside the bounds the calculator asks for.




Ex: find the maxima and minima of $y = x^4 - 45x^2 - 196$ →



# Review: Quadratic Max/Min

A quadratic function has two forms:

| Standard: | Vertex: |
| --- | --- |
| $y = Ax^2 + Bx + C$ | $y = a(x - h)^2 + k$ |
| | where (h, k) is the vertex |

to get the vertex:

$h = \frac{-B}{2A}$

k: plug the number above into the equation

A model rocket shoots straight upward such that its height in feet is modeled by $y(t) = -16t^2 + 20t + 1$. What is the rocket's maximum height and how long does it take to get there?

$t = \frac{-b}{2a} = \frac{-20}{2(-16)} = 0.625s$

$y = -16(0.625)^2 + 20(0.625) + 1$

$= 7.25ft$

## Practice

Modeling Using Quadratic Functions; starting with #5 – 16

comment on #10 & 11:

revenue (money made) = demand * # sold

profit = revenue - cost

## Reflection

What can the maximum of a parabola represent?