



Function – Process & Object

- Section 1.3



Model: Immigration

The Statistical Abstract of the U.S. reports immigration to the U.S. in thousands.

Let's explore this data from multiple perspectives.

Year	Immigrants
1982	594
1983	560
1984	544
1985	570
1986	602
1987	602
1988	643
1989	1091
1990	1536



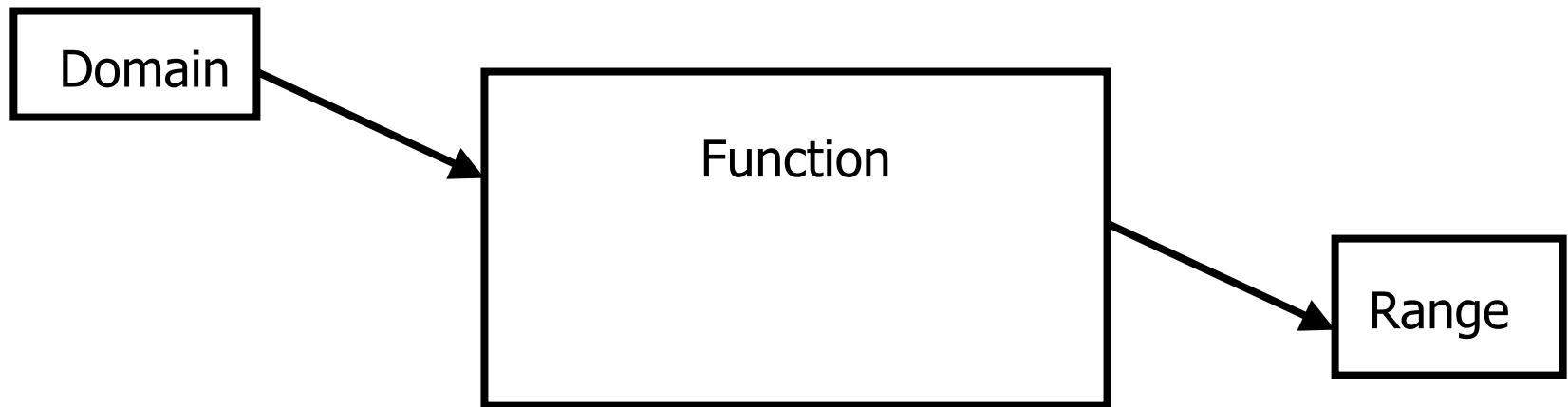
Function

- Does this data represent a function? Why or why not?
- Solution: Yes, each year is assigned only one value.

Year	Immigrants
1982	594
1983	560
1984	544
1985	570
1986	602
1987	602
1988	643
1989	1091
1990	1536

Process Interpretation of Function

- A function is a dynamic process assigning each domain value to a unique value of the range.





Numeric Form

- Using the process interpretation, what is the domain and range of the Immigration data?
- Solution:
 - Domain {1982, 1983...1990}
 - Range {594, 560, ...1536}

Year	Immigrants
1982	594
1983	560
1984	544
1985	570
1986	602
1987	602
1988	643
1989	1091
1990	1536



Translate Numeric to Algebraic

- Moving from Numeric (table) to algebraic (equation) requires fitting a curve to the Immigration data.
- $F(x) = 32x^2 - 293x + 1134$
- What is the domain and range of the modeling function?
 - Domain is all reals
 - Restricted domain is $x \geq 0$
 - Range is difficult to determine from an equation



Translate Algebraic to Graphic

- Moving from algebraic (equation) to graphic requires plotting a curve.
- What is the domain and range of the graph of the function?
 - Trace values on x-axis to read domain, domain is all reals
 - Trace values on the y-axis to read range, range is about $[500, +\infty)$

Immigrant

3500

3000

2500

2000

1500

1000

500

Year

-2

2

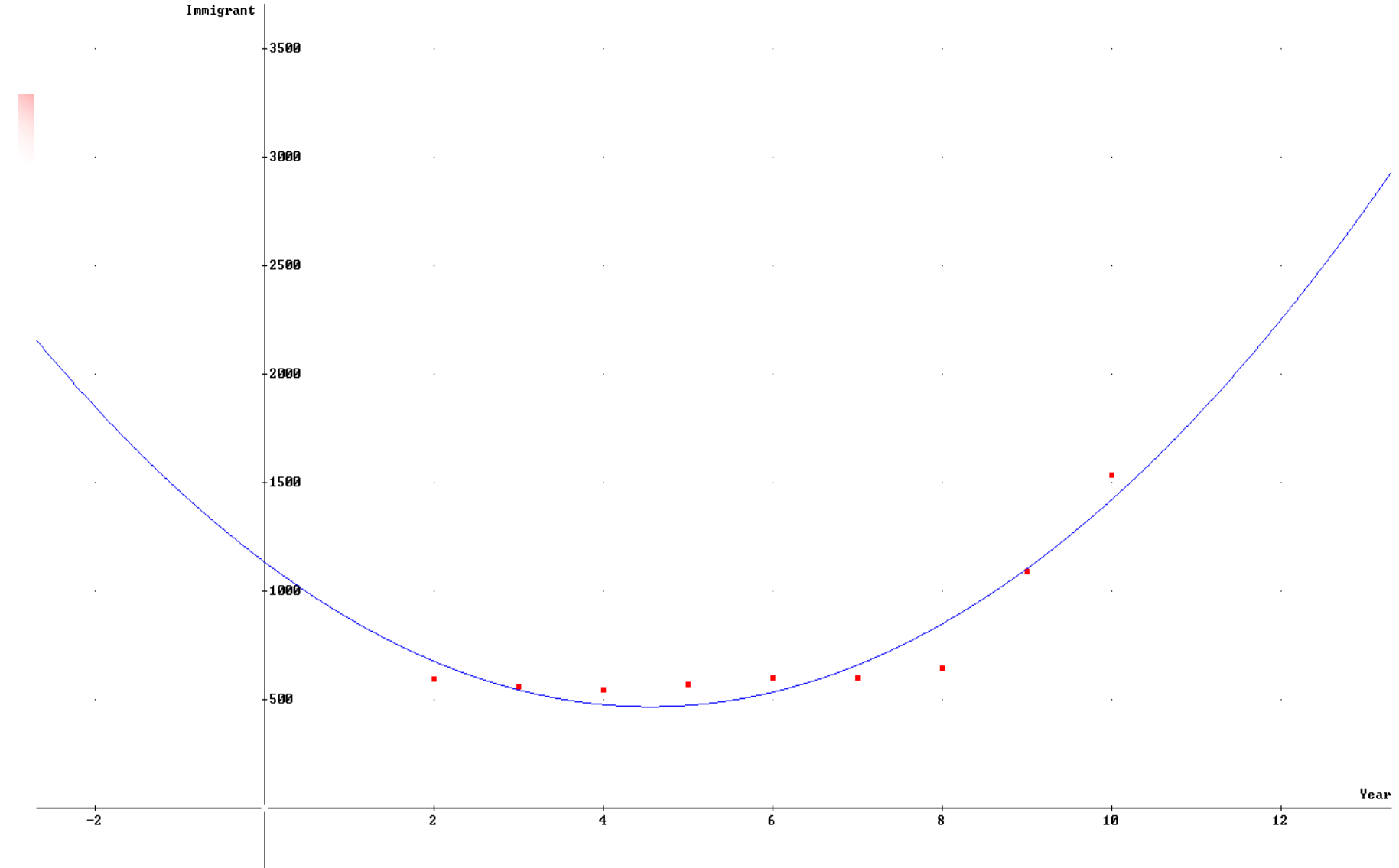
4

6

8

10

12



Notation Systems for Domain and Range

- There are 3 notation systems for representing domains and ranges
 - Numeric – Interval Notation $(2,40]$
 - Algebraic – Inequality Notation $x > 30$
 - Graphic – Number Line





7 Basic Functions

- Determine the domain and range of the following seven basic functions using the process interpretation of function?
 - $F(x) = 5$
 - $F(x) = x$
 - $F(x) = x^2$
 - $F(x) = x^3$



7 Basic Functions

- Determine the domain and range of the following basic functions using the process interpretation of function?

$$F(x) = \sqrt{x}$$

$$F(x) = \frac{1}{x}$$

$$F(x) = |x|$$



Object Interpretation of Function

- A function is a static object that can be operated upon.
- Object interpretation has two uses:
 - Classification of function by properties
 - Performing Operations on functions



Symmetry of Relations

- A relation is symmetric with respect to the y -axis if it is a mirror image of itself through the y -axis. We call such relations **even**.
- Is the Immigration model even?
 - Solution: No it is not a mirror image in the y -axis.
- How can we tell if a relation is even if it is in numeric form? Graphic form? Algebraic form?



Symmetry of Relations

- A relation is symmetric with respect to the origin if the graph lands on itself when rotated a $\frac{1}{2}$ turn about the origin. We call such relations **odd**.
- Is the basic cubic function odd?
 - Solution: Yes, a $\frac{1}{2}$ rotation places it on itself.
- How can we tell if a relation is odd if it is in numeric form? Graphic form? Algebraic form?

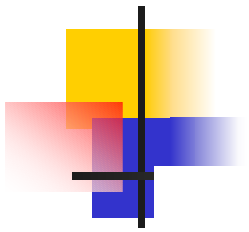


Symmetry and Curve Sketching

- Symmetry is very useful in determining the shape of a graph of a function.
- Use symmetry to sketch the graph of the following relation.

$$f(x) = x^4 + x^2 + 5$$

- Why do you we think we call functions with symmetry to the y-axis even?



Plot of $f(x) = x^4 + x^2 + 5$

