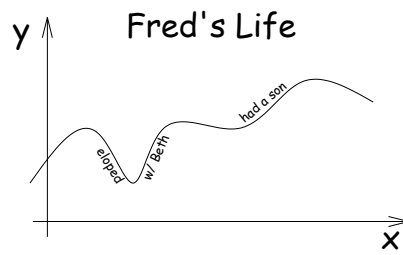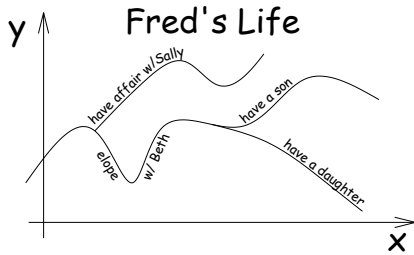Understanding functions and function notation is crucial to understanding much of mathematics. This activity should help you with an initial understanding of functions.

1)   Explain how one of these could represent a function while the other would not. Be explicit.

2)   Which of these represent a function and which do not. Explain your answer. Be explicit.

| ID# (x)	DOB (Y_1)	Allergies (Y_2)	SSN (Y_3)	Meds (Y_4)
101	Fcn: Yes No	Fcn: Yes No	Fcn: Yes No	Fcn: Yes No
102				
103				
104				
105				
106				

3)   Which of these represent a function and which do not. Explain your answer. Be explicit.

$y = mx + b$	$x^2 + y^2 = 1$	$y = ax^2 + bx + c$	$y = 2 \pm \sqrt{3x}$
Fcn: Yes No	Fcn: Yes No	Fcn: Yes No	Fcn: Yes No

4)   Which of these represent a function and which do not.

x: race time y: Bib #	x: Bib # y: race time	x: gross income y: Fed tax in 2010	x: age y: hair color
Fcn: Yes No	Fcn: Yes No	Fcn: Yes No	Fcn: Yes No
x: MD's age y: office wait time	x: Name y: DOB	x: DOB y: age 1/1/2012	x: Fed tax paid y: Gross Income
Fcn: Yes No	Fcn: Yes No	Fcn: Yes No	Fcn: Yes No

5) (a) f(-3) =   (b) f(2) =

    (c) f(10) =   (d) (f + g)(2) =

    (e) (f + g)(10) =   (f) f(6) g(10) =

    (g) (f/g)(0) =   (h) 2 f(4) + 5 =
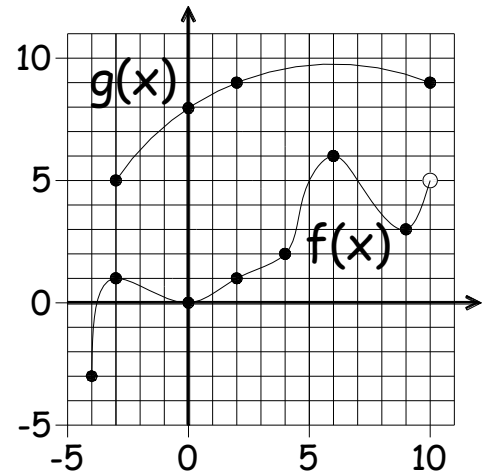
    Domain of f(x):

    Range of f(x):

6) $f(x) = 3x^2 - 2$ $g(x) = x + 1$ $p(x) = \dfrac{x + 1}{x}$

    (a) f(-2) =   (b) f(0) =   (c) p(0) =

    (d) (f + g)(5) =   (e) f(t) =   (f) g(a + b) =

   (g) p(x – 1) =   (h) f(x) + 2 =   (i) $g^2(x) =$

7) You are tasked with collecting and organizing data then finding a function that corresponds to that data. First you must organize the data into independent vs dependent (x vs y). Fill in the indicated variables. Write 'unrelated' if the variables are unrelated.

    Elevation & 10K Race Time   x-var: _____   y-var: _____

    Age & 10K Race Time   x-var: _____   y-var: _____

    Hair Color & 10K Race Time   x-var: _____   y-var: _____

8) Consider this data set:
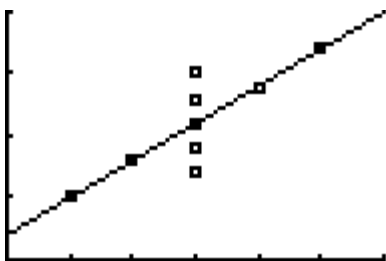
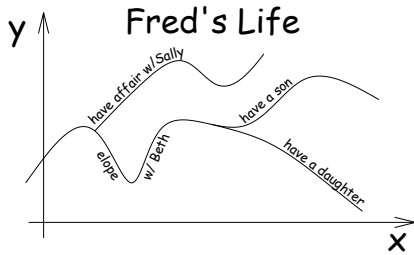| x	1	2	3	4	5
y	5	8	7,9,11,13,15	14	17

Does the data represent a function?

If you run Linear Regression (try it if you can) you get

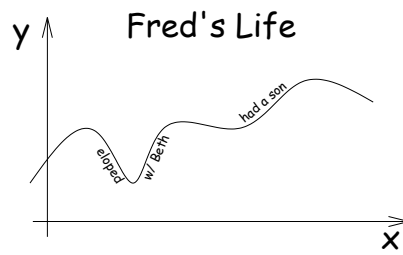y = 3x + 2 which is a function.

Do you think your regression function/equation is a good descriptor for this data? Why/why not?

Understanding functions and function notation is crucial to understanding much of mathematics.   This activity should help you with an initial understanding of functions.

1)   Explain how one of these could represent a function while the other would not. Be explicit.

y↑   Fred's Life

have affair w/ Sally
elope
w/ Beth
have a son
have a daughter

x

y↑   Fred's Life

eloped
w/ Beth
had a son

x

Fred could both elope with Beth <u>and</u> have an affair with Sally so this is not a function

Fred takes one unique path through his life. This is a function.

2)   Which of these represent a function and which do not. Explain your answer. Be explicit.

ID# (x)	DOB (Y$_1$)	Allergies (Y$_2$)	SSN (Y$_3$)	Meds (Y$_4$)
101	Fcn: <u>Yes</u> No	Fcn: Yes <u>No</u>	Fcn: <u>Yes</u> No	Fcn: Yes <u>No</u>
102	ID is a unique identifier and each person can have only one DOB. However, if 'Born Again' were included then it's not a function	A person may have multiple allergies. Hence not a function.	Legally, each person should have one unique SSN. Hence a function.	A person may be taking multiple medications. Hence not a function.
103				
104				
105				
106				

3)   Which of these represent a function and which do not. Explain your answer. Be explicit.

y = mx + b	$x^2 + y^2 = 1$	$y = ax^2 + bx + c$	$y = 2 \pm \sqrt{3x}$
Fcn: **Yes** No	Fcn: Yes **No**	Fcn: **Yes** No	Fcn: Yes **No**
The only line that is not a function is a vertical line. Since y = mx + b cannot be vertical, this is a function.	This is a circle which does not pass the VLT. Also, $y = \pm\sqrt{1 - x^2}$ which has 2 outputs for each x≠±1. e.g. x = 0, y = ±1	This is a parabola which passes the VLT. Hence a function.	This is a parabola turned sideways which does not pass the VLT. Hence not a function. Specifically, x = 3, y = -1 or 5

4)   Which of these represent a function and which do not.

x: race time y: Bib #	x: Bib # y: race time	x: gross income y: Fed tax in 2010	x: age y: hair color
Fcn: Yes **No**	Fcn: **Yes** No	Fcn: Yes **No**	Fcn: Yes **No**
Two or more racers could cross finish line at the same time. Hence not a function.	Each racer has one unique finish time. Hence a function.	2 Taxpayers with same gross income may have different deductions / tax liabilities. Hence not a function.	Variables are unrelated. Hence not a function.

x: MD's age y: office wait time	x: Name y: DOB	x: DOB y: age 1/1/2012	x: Fed tax paid y: Gross Income
Fcn: Yes **No**	Fcn: **Yes** No	Fcn: **Yes** No	Fcn: Yes **No**
These variables should be unrelated. Hence not a function.	Assuming Name is a unique identifier this is a function. If Name = First Name only, this would not be a function.	Age = 1/1/2012 – DOB is a unique value. Hence a function.	People who pay no tax could have a wide variety of incomes. Hence not a function.

5) (a) f(-3) = 1   (b) f(2) = 1

    (c) f(10) = DNE   (d) (f + g)(2) = 10

    (e) (f + g)(10) = DNE   (f) f(6) g(10) = (6)(9) = 54

    (g) (f/g)(0) = 0/8 = 0   (h) 2 f(4) + 5 = 9

Domain of f(x): -4 ≤ x < 10 or x ∈ [-4, 10)

Range of f(x): -3 ≤ y ≤ 6 or y ∈ [-3, 6]
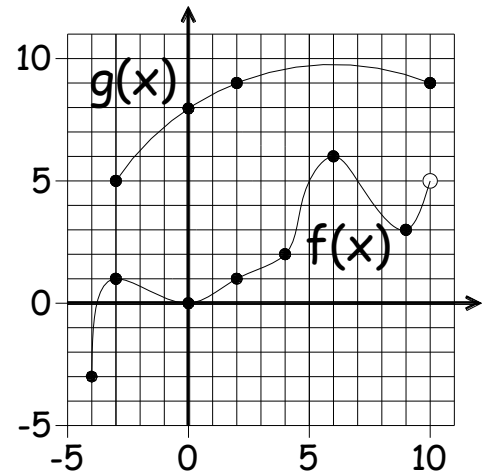
6) f(x) = 3x² – 2   g(x) = x + 1   p(x) = $\frac{x + 1}{x}$

    (a) f(-2) = 10   (b) f(0) = -2   (c) p(0) = DNE

    (d) (f + g)(5) = 79   (e) f(t) = 3t² – 2   (f) g(a + b) = (a + b) + 1 = a + b + 1

    (g) p(x – 1) = $\frac{(x - 1) + 1}{(x - 1)}$ = $\frac{x}{x - 1}$ (h) f(x) + 2 = (3x2 – 2) + 2 = 3x²   (i) g²(x) = (x + 1)²

7) You are tasked with collecting and organizing data then finding a function that corresponds to that data. First you must organize the data into independent vs dependent (x vs y). Fill in the indicated variables. Write 'unrelated' if the variables are unrelated.

    Elevation & 10K Race Time   x-var: _Elevation_____   y-var: _Racetime_____

    Age & 10K Race Time   x-var: _Age_____   y-var: _Racetime_____

    Hair Color & 10K Race Time   x-var: _Unrelated_____   y-var: _____

8)   Consider this data set:
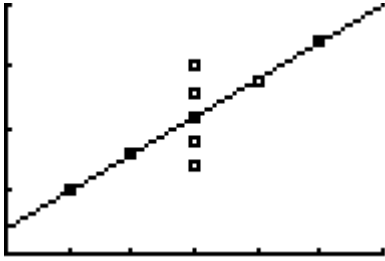
x	1	2	3	4	5
y	5	8	7,9,11,13,15	14	17

Does the data represent a function? **No**

If you run Linear Regression (try it if you can) you get

y = 3x + 2 which is a function.

Do you think your regression function/equation is a good descriptor for this data? Why/why not?

No. The function y = 3x + 2 does not do a good job of representing the variation associated with x = 3.