HW2: Due Thursday, Sept. 4

Section 1.2

2) Classify each function as a power function, root function, polynomial (state its degree), rational function, algebraic function, trig function, exponential function, or logarithmic function.

a) $y = \pi^x$

b) $y = x^\pi$

c) $y = x^2(2 - x^3)$

d) $y = \tan t - \cos t$

e) $y = s/(1 + s)$

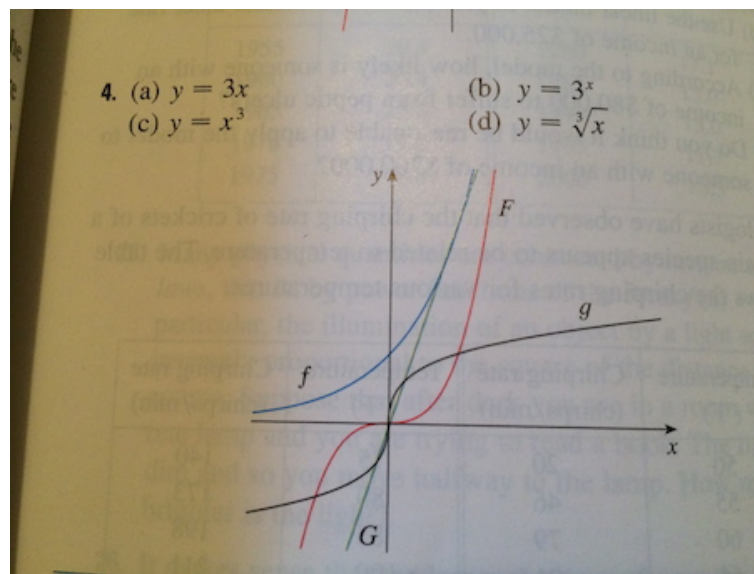f) $y = (\sqrt{x^3 - 1})/(1 + \sqrt[3]{x})$

4) Match each equation with its graph. Explain your choices. (Don't use a computer or graphing calculator!)

a) $y = 3x$

b) $y = 3^x$

c) $y = x^3$

d) $y = \sqrt[3]{x}$

6) What do all members of the family of linear functions $f(x) = 1 + m(x + 3)$ have in common? Sketch several members of the family.

8) Find expressions for the quadratic functions whose graphs are shown.

Find an expression for a cubic function f if $f(1) = 6$ and $f(-1) = f(0) = f(2) = 0$.

15) Biologists have noticed that the chirping rate of crickets of a certain species is related to temperature, and the relationship appears to be very nearly linear. A cricket produces 113 chirps per minute at $70°F$ and 173 chirps per minute at $80°F$.

a) Find a linear equation that models the temperature T as a function of the number of chirps per minute N.

b) What is the slope of the graph? What does it represent?

c) If the crickets are chirping at 150 chirps per minute, estimate the temperature.

[TA's note: *I was all set to go on a rant about how this was a contrived and silly example of how to apply math to real-world problems, but it turns out that it's true: see en.wikipedia.org/wiki/Dolbear's_law*]

17) At the surface of the ocean, the water pressure is the same as the air pressure above the water, 15lb/in^2. Below the surface, the water pressure increases by $4.34\ \text{lb/in}^2$ for every 10 ft of descent.

a) Express the water pressure as a function of the depth below the ocean surface. Be sure to specify your units!

b) At what depth is the pressure $100\ \text{lbs/in}^2$?

19) For each scatter plot below, decide what type of function you might choose as a model for the data. Explain your choices.
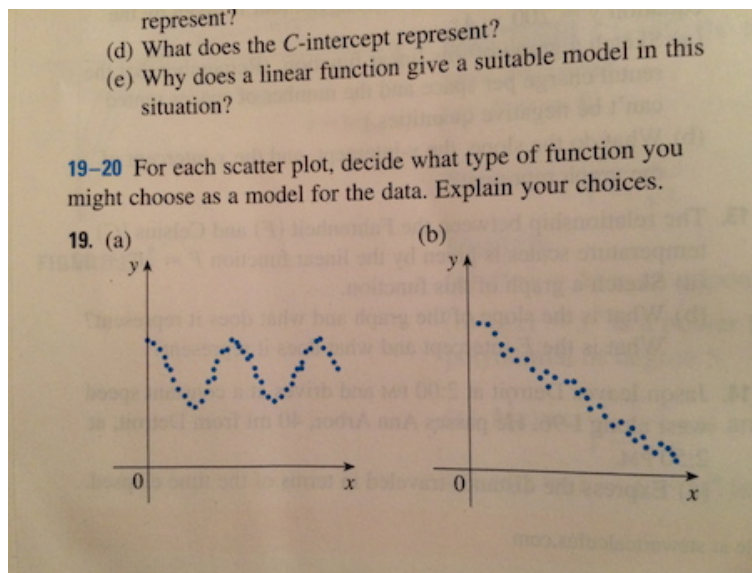
24) The table shows the percentage of the population of Argentina that has lived in rural areas from 1955 to 2000. Find a model for the data and use it to estimate the rural percentage in 1988 and in 2002.

Year	Percentage rural	Year	Percentage rural
1955	30.4	1980	17.1
1960	26.4	1985	15.0
1965	23.6	1990	13.0
1970	21.1	1995	11.7
1975	19.0	2000	10.5

25) Many physical quantities are connected by *inverse square laws*, that is, by power functions of the form $f(x) = kx^{-2}$. In particular, the illumination of an object by a light source is inversely proportional to the square of the distance from the source. Suppose that after dark you are in a room with just one lamp and you are trying to read a book. The light is too dim and so you move halfway to the lamp. How much brighter is the light?

27) The table shows the number N of species of reptiles and amphibians inhabiting Caribbean islands and the area A of the island in square miles.

Island	A	N
Saba	4	5
Monserrat	40	9
Puerto Rico	3,459	40
Jamaica	4,411	39
Hispaniola	29,418	84
Cuba	44,218	76

a) Use a power function to model N as a function of A.

b) The Caribbean island of Dominica has area 291 mi^2. How many species of reptiles and amphibians would you expect to find on Dominica?