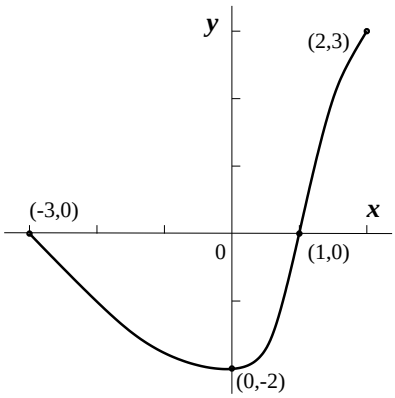
#1 **Problems for 153** 9/3/2009

1. To the right is a graph of $y = A(x)$.



a) Find the domain and range of A.

b) If B is defined by $B(x) = A(x) + 1$, sketch the graph of B as well as you can. Find the domain and range of B.

c) If C is defined by $C(x) = A(2x + 3)$, sketch the graph of C as well as you can. Find the domain and range of C.

d) If D is defined by $D(x) = \dfrac{1}{A(x)}$, sketch the graph of D as well as you can. Find the domain and range of D.

2. Suppose $f(x) = \sqrt{\frac{x}{4-x}}$.

a) Find the graph of $y = f(x)$ in the window $-5 \le x \le 5$ and $0 \le y \le 10$.

b) What is the domain of f? Verify your statement algebraically.

c) Solve $y = f(x)$ for x. What is the range of f? Your expression for x in terms of y may help to verify your statement algebraically.

3. A piece of wire 180 inches long is bent into the shape of an isosceles trapezoid whose base angles are $\pi/3$ radians.

a) Suppose x is the length of the lower base of the trapezoid and y is the length of one of the slanted sides. Label the lengths of all sides in terms of x and y and deduce a relationship between x and y.

b) Find a formula for the area A of the trapezoid as a function of the single variable x.

c) Use your calculator to graph the function $A = A(x)$. Are there any upper or lower bounds between which the value of x must lie? If so, decide what happens to A as x approaches those bounds, and explain by drawing pictures of the trapezoid in those cases.

4. If an example of any of the following exists, describe the example and explain why it fulfills the requirements. Sketch a graph of the example. If an example doesn't exist, explain why no such example exists.

a) A polynomial whose roots are exactly the numbers 1, -2 and 3.475.

b) A polynomial whose roots are exactly the numbers 1, -2 and 3.475 and whose non-zero values are always positive.

c) A polynomial whose roots are exactly the numbers 1, -2 and 3.475 and which has degree 100,000.

d) A polynomial whose roots are exactly the numbers 1, -2 and 3.475 and which has degree 100,000 and whose non-zero values are always positive.

e) A polynomial whose roots are exactly the numbers 1, -2 and 3.475 and which has degree 57 and whose non-zero values are always positive.

One problem will be selected for a writeup to be handed in at the next recitation meeting. Please see Professor Greenfield's Math 153 webpage to learn which problem to hand in.