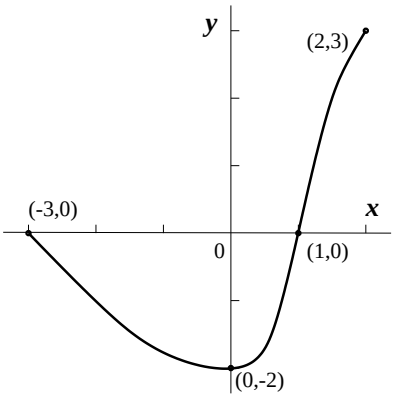
1. A graph of $y = A(x)$ is shown to the right. Answer the following questions as well as you can.



a) What are the domain and range of A?

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

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

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

2. 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.

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) Let x be the length of the longer base of the trapezoid and let y be 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.

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4. a) Graph $y = |x - 2|$ and $y = |x - 3|$ on the same set of axes. From this graph, decide for which real numbers x the inequality $|x - 2| < |x - 3|$ is valid. Interpreting $|a - b|$ as the distance between a and b on the number line, give a geometrical explanation why your solution in is correct.

b) Use your calculator to sketch a graph of $y = \big|x - |x - 3|\big|$. Give a "piecewise" definition of the function whose graph was just sketched *without* mentioning absolute value. The graph may help to answer this question, but you should justify your answer algebraically with a case-by-case argument from the equation for y (of the sort "when $x \geq 3$ then y is given by the formula ...").

Why these particular problems at this particular time?

Some answers to this question are linked to the course web page.