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Mr. Gmerek
Calculus
Problem Set 1.2

1. What is a function?

   For every input there is exactly one output

   a. What is the notation used to denote a function? How is it read?

      $f(x)$ "f of x"

2. $A(r) = \pi r^2$

   a. What are the independent and dependent variables? Why?

      r ↑ A ↑ because it depends on r

   b. Find the area of a circle, in terms of pi, whose radius is 4.

      $A(4) = \boxed{16\pi}$

3. Interval notation is often used as a way to represent the domain and range of a function. A closed bracket means inclusive and an open bracket does not include the number. Also, if a number gets skipped, you must use the union of two intervals.

   a. Write the domain of the following functions in two different ways; one using inequalities and the other using interval notation.

      i. $f(x) = x^2$

      $-\infty < x < \infty$

      $(-\infty, \infty)$

      ii. $f(x) = \frac{1}{x^2}$

      $x < 0$ or $x > 0$

      $(-\infty, 0) \cup (0, \infty)$

      iii. $f(x) = \sqrt{x}$

      $x \geq 0$

      $[0, \infty)$

      iv. $f(x) = \sqrt{7 - x}$

      $x \leq 7$

      $(-\infty, 7]$

      v. $f(x) = \frac{1}{x - 2}$

      $x \neq 2$

      $(-\infty, 2) \cup (2, \infty)$

      vi. $f(x) = \frac{1}{x^2 + 5x + 6} = \frac{1}{(x+3)(x+2)}$

      $x \neq -3, -2$

      $(-\infty, -3) \cup (-3, -2) \cup (-2, \infty)$

4. Find the domain and range of $f(x) = \frac{1}{\sqrt{4 - x^2}}$ using a graphing calculator.

   D: $(-2, 2)$

   R: $[.5, \infty)$

   a. Find when x = 0.

      $f(0) = \frac{1}{2}$

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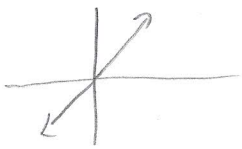
5. Sketch a graph of the following and state the domain and range using inequalities:

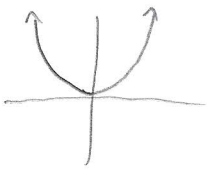
a. y = x



D: $-\infty < x < \infty$

R: $-\infty < y < \infty$

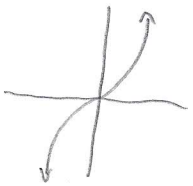
b. $y = x^2$



D: $-\infty < x < \infty$

R: $0 \leq y < \infty$

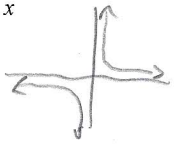
c. $y = x^3$



D: $-\infty < x < \infty$

R: $-\infty < y < \infty$

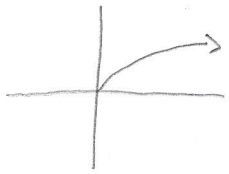
d. $y = \frac{1}{x}$



D: $x < 0$ OR $x > 0$

R: $y < 0$ OR $y > 0$

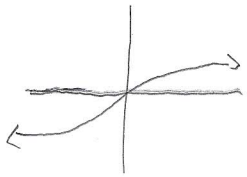
e. $y = \sqrt{x}$



D: $x \geq 0$

R: $y \geq 0$

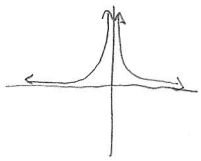
f. $y = \sqrt[3]{x}$



D: $-\infty < x < \infty$

R: $-\infty < x < \infty$

g. $y = \frac{1}{x^2}$



D: $x < 0$ OR $x > 0$

R: $y > 0$

6. Define what it means for a function to be odd or even both graphically and algebraically (Hint: f(-x) = ?).

odd

Symmetric about origin

$f(-x) = -f(x)$

even

Symmetric about y-axis

$f(-x) = f(x)$

7. Prove algebraically whether the following functions are even or odd.

a. $f(x) = x^2$

$f(-x) = (-x)^2 = x^2 = f(x)$ even!

b. $f(x) = x^2 + 1$

$f(-x) = (-x)^2 + 1 = x^2 + 1 = f(x)$ even!

c. $f(x) = x$

$f(-x) = -x = -f(x)$ odd!

d. $f(x) = x + 1$

$f(-x) = -x + 1 \neq f(x)$

$f(-x) = -x + 1 \neq -f(x)$

neither!

e. $f(x) = (x - 3)^2 + 2$

$f(-x) = (-x - 3)^2 + 2 \neq f(x)$

$f(-x) = (-x - 3)^2 + 2 \neq -f(x)$

neither!

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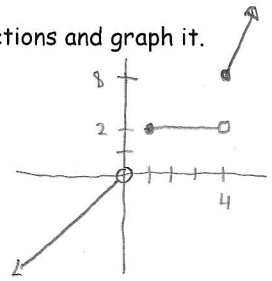
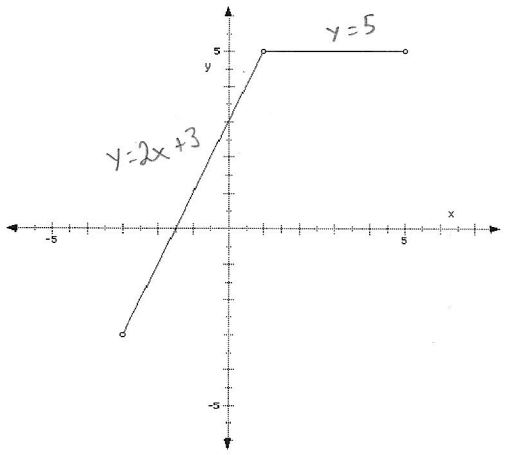
8. Piecewise functions - a function defined by different formulas to different parts of its domain.

   a. Give an example that is defined by three functions and graph it.

$$f(x)=\begin{cases} x & x<0 \\ 2 & 1\le x<4 \\ 2x & x\ge 4 \end{cases}$$

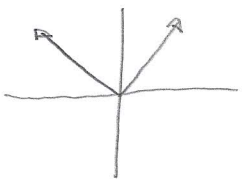


9. Define the graph below.



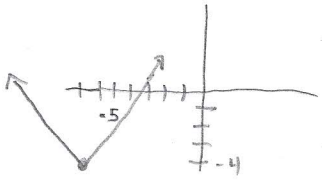
$$f(x)=\begin{cases} 2x+3 & -3<x<1 \\ 5 & 1<x<5 \end{cases}$$

10. Graph $f(x)=|x|$ and define it piecewisely.



$$f(x)=\begin{cases} -x & x<0 \\ 0 & x=0 \\ x & x>0 \end{cases}$$

11. Find the domain and range of $f(x)=|x+7|-4$. Sketch the graph.



D: $(-\infty, \infty)$

R: $[-4, \infty)$

12. Find f(x) and g(x) such that h(x) = f(g(x)) where $h(x)=\sqrt{x^2+1}$.

   a. What is f(g(x)) called? How is it read?

composition of functions

f of g of x

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

$g(x)=x^2+1$

other answers may exist!