Review 1.2+1.3

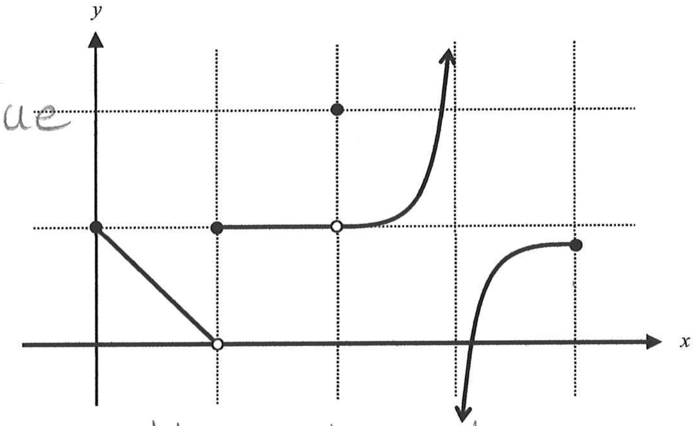
KEY

Pre Calculus
Worksheet 1.2 Day 1

1. The relation described by the set of points $\{(-2,5),(0,5),(3,8),(3,9)\}$ is NOT a function. Explain why.

$f(3)=8$ - does not pass vertical line test.
$f(3)=9$ -

For questions 2 - 4, use the graph at the right.



2. Explain why the graph represents a function.

- every value of x has unique y.
- passes vertical line test.

3. Where is the function above discontinuous.
   Describe each type of discontinuity.

$x=1$ Jump non-rem. disc.
$x=2$ removable
$x=3$ infinte non-removable discontinuity

4. Using interval notation, describe the domain and range of the function above?

domain: $[0,3)\cup(3,4]$
range: $(-\infty,\infty)$

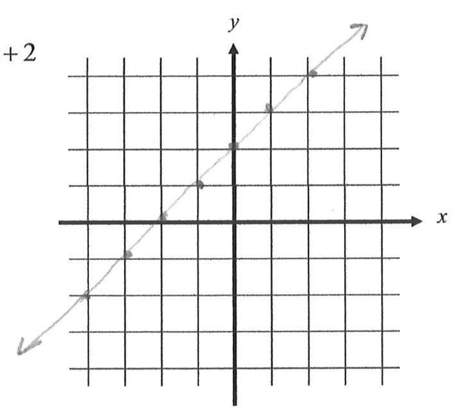
5. What are the **2** domain issues you must remember in this course?

- no zero in denominator
- no negative under square root

6. Graph each of the following functions. What do you notice? What happens when $x=2$ on the graph of b?

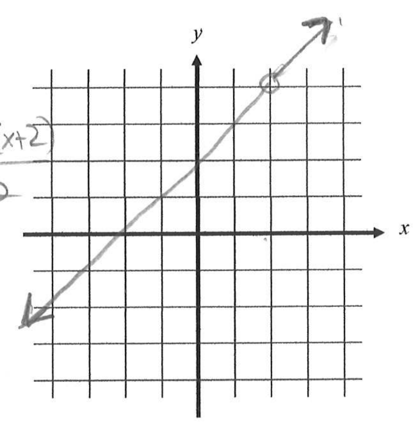
a) $f(x)=x+2$

x	y
-1	1
0	2
1	3
2	4



b) $g(x)=\dfrac{x^2-4}{x-2}$

$g(x)=\dfrac{(x-2)(x+2)}{x-2}$



7. What is the domain and range of the two functions above?

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

b) D: $(-\infty,2)\cup(2,\infty)$
R: $(-\infty,4)\cup(4,\infty)$

8. For each of the following functions, describe the domain in interval notation and then, for any values NOT in the domain, identify the type of discontinuity (if they exist). You need to find the domain without using your calculator. You MAY use your calculator to determine the type of discontinuity, but we will find the discontinuity algebraically later this semester.

a) $f(x)=x^3-2x^2+1$

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

Discontinuity: Continuous

b) $g(x)=\log(x-4)$

Domain: $[4, \infty)$

Discontinuity: Continuous.

c) $h(x)=\dfrac{\sqrt{x+4}}{x-3}$ $x \neq 3$, $x \geq -4$

Domain: $[-4,3) \cup (3,\infty)$

Discontinuity: infinite discontinuity

d) $k(x)=\dfrac{x^2-2x}{x}$ $=\dfrac{x(x-2)}{x}$ $x \neq 0$

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

Discontinuity: removable discontinuity.

e) $h(x)=\dfrac{8x^2-14x-15}{6x^2-13x-5}$

Domain: $(-\infty,-.69) \cup (-.69, 1.19) \cup (1.19, \infty)$

Discontinuity: Infinite discontinuity.

f) $p(x)=\dfrac{3x^2+5x+2}{(x+1)\sqrt{2x+9}}$ $x \neq -1$, $2x+9>0$, $x>-9/2$

Domain: $(-4.5,-1) \cup (-1,\infty)$

Discontinuity: Removable

g) $j(x)=\dfrac{1}{x}+\dfrac{5}{x-2}$ $x \neq 0$, $x \neq 2$

Domain: $(-\infty,0) \cup (0,2) \cup (2,\infty)$

Discontinuity: Infinite Disc

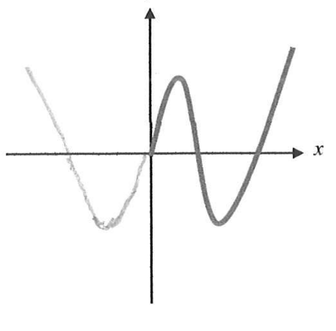
h) $q(x)=\dfrac{\sqrt{4-x^2}}{x-3}$ $4-x^2 \geq 0$, $4 \geq x^2$, $x \leq 2$ $x \geq -2$, $x \neq 3$

Domain: $[-2,2]$

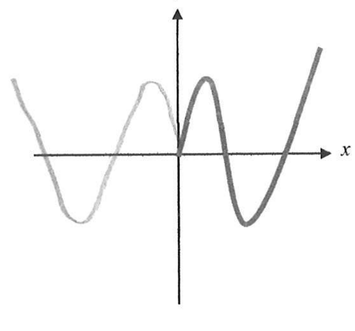
Discontinuity: Continuous

9. The given function is only drawn for $x \geq 0$. Complete the function for $x < 0$ with the following conditions:

a) the function is ODD



b) the function is EVEN

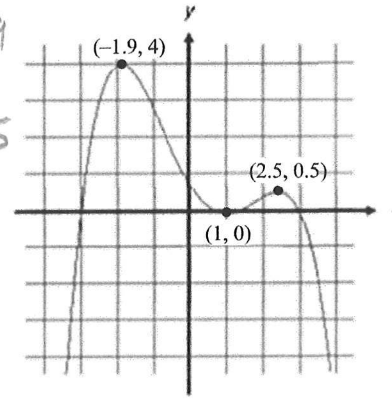


10. Suppose you know the point (–2, –10) is on the graph of a function.

a) If the function is ODD, what other point is on the function? (2, 10)

b) If the function is EVEN, what other point is on the function? (2, −10)

11. Use the graph at the right to answer the following questions:



a) Identify all extrema.

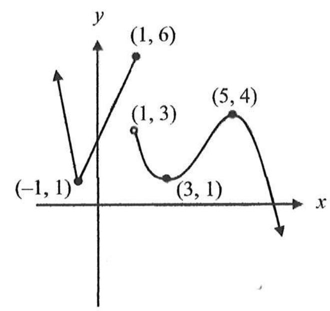
Absolute max of 4 @ x = −1.9
Local min of 0 @ x = 1
Local max of 0.5 @ x = 2.5

b) Identify the intervals on which the function is increasing and decreasing.

inc: $(-\infty, -1.9] \cup [1, 2.5]$

dec: $[1.9, 1] \cup [2.5, \infty)$

12. Use the graph at the right to answer the following questions:



a) Identify all extrema.

max of 6 @ x = 1
of 4 of x = 5

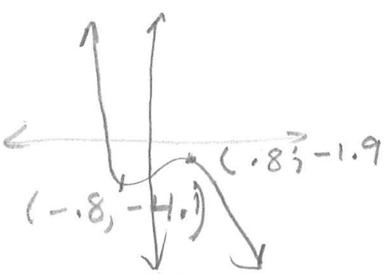
min of 1 @ x = −1; 1 @ x = 3

b) Identify the intervals on which the function is increasing and decreasing.

inc: $[-1, 1] \cup [3, 5]$

dec: $[-\infty, -1] \cup (1, 3] \cup [5, \infty)$

13. Use your graphing calculator to graph the function $g(x) = -x^3 + 2x - 3$.



a) Identify all extrema. local min −4.1 @ x = −.8

local max −1.9 x = .8

b) Identify the intervals on which the function is increasing and decreasing.

inc $[-.8, .8]$

dec: $(-\infty, -.8] \cup [.8, \infty)$

14. Determine whether the following functions are bounded above, bounded below, bounded, or not bounded.

a) $y = 32$ b) $y = 2^x$ c) $y = 2 - x^2$ d) $y = \sqrt{1 - x^2}$ e) $y = x^2\sqrt{x + 4}$

Bounded B. Below B. above Bounded B. Below

Pre Calculus
Worksheet 1.2 Day 2

1. Let $f(x) = -2x^3 + 7x$ and $g(x) = |2x| - 5$. Answer the following.

a) $-f(x)$ $= 2x^3 - 7x$

b) $f(-x)$ $= 2x^3 - 7x$

c) $g(-a)$ $= |2x| - 5$

d) $-g(a)$ $= -|2x| - 5$

2. How do you algebraically prove a function is ODD or EVEN ?

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

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

3. Prove whether each function is even, odd or neither. SHOW ALL STEPS!!

a) $f(x) = \sqrt{x^2 + 2}$

$f(-x) = \sqrt{(-x)^2 + 2}$

$= \sqrt{x^2 + 2}$

even

b) $g(x) = 2x^3 - 3x$

$g(-x) = 2(-x)^3 - 3(-x)$

$= -2x^3 + 3x$

ODD

c) $h(x) = -x^2 + 0.03x + 5$

Show steps

Neither

d) $k(x) = x^3 + 4.2x^2 - 7$

Showsteps

Neither

e) $g(x) = \dfrac{3x^4}{1 + x^2}$

showsteps

EVEN

f) $j(x) = \dfrac{5}{|x|}$

Show steps

EVEN

4. Write the end behavior of the function using limit notation. Graphing calculator allowed.

a) $f(x) = -x^3 - 2$

$\lim_{x \to -\infty} f(x) = \infty$ $\lim_{x \to \infty} f(x) = -\infty$

b) $f(x) = xe^{-x}$

$\lim_{x \to -\infty} f(x) = -\infty$

$\lim_{x \to \infty} f(x) = 0$

c) $f(x) = |3 - x|$

$\lim_{x \to \pm\infty} f(x) = \infty$

d) $f(x) = \dfrac{-x^3}{x - 1}$

$\lim_{x \to \pm\infty} f(x) = -\infty$

e) $f(x) = \dfrac{4x - 1}{x + 3}$

$\lim_{x \to \pm\infty} f(x) = 4$

f) $f(x) = \dfrac{4x}{x^2 + 1}$

$\lim_{x \to \pm\infty} f(x) = 0$

Pre Calculus
Worksheet 1.3

1. Sketch the 12 basic functions from memory. Section 1.3 in text

$y = x$ $y = x^2$ $y = x^3$ $y = \sqrt{x}$ $y = \frac{1}{x}$

~~$y = b^x$~~ $y = e^x$ ~~$y = \log_b x$~~ $y = \ln x$ $y = \sin x$ $y = \cos x$ $y = |x|$

$y = \lfloor x \rfloor$ greatest integer $y = \frac{1}{1+e^{-x}}$

Use the equation(s) above (not the names) to answer questions 2 – 15. check section 1.3 in text.

2. Seven of the twelve basic functions have the property that $f(0) = 0$. Which five do not?

3. Identify the four basic functions that are odd.

4. How many of the twelve basic functions are even? List them.

5. Identify the six basic functions that are increasing on their entire domains.

6. Identify the three basic functions that are decreasing on the interval $(-\infty, 0)$.

7. Only 3 of the twelve basic functions are bounded. Which three?

8. Which of the twelve basic functions are not continuous? Identify the types of discontinuity in each function.

9. Identify the three basic functions with no zeros.

10. How many of the twelve basic functions have a range of all real numbers? List them.

11. Identify the four functions that do NOT have end behavior $\lim_{x \to \infty} f(x) = \infty$.

12. How many of the twelve basic functions have end behavior $\lim_{x \to -\infty} f(x) = -\infty$? List them.

check text

13. How many of the twelve basic functions look the same when flipped about the y-axis? List them.

14. How many of the twelve basic functions look the same upside down as right-side up? List them.

15. How many of the twelve basic functions are bounded below? List them.

10. Sketch a freehand graph of a function with domain $(-\infty, \infty)$ that satisfies ALL of the listed conditions.

a) f is continuous for all x

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

c) f is increasing on $[0, 2)$ and decreasing on $[2, \infty)$

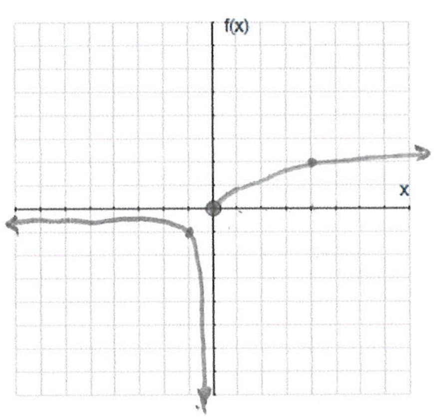
d) $f(2) = 3$

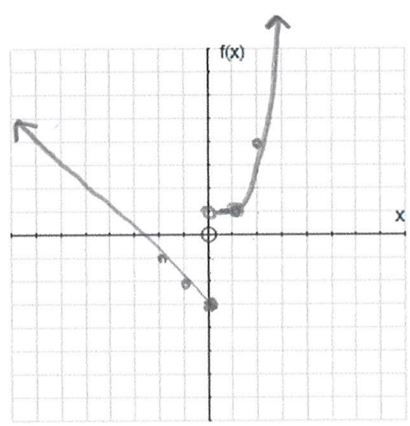
answers will vary

21. Sketch the graph of each piecewise-define function without a calculator.
Be sure to ask yourself … "Self, do my graphs pass the vertical line test?".

a) $f(x)=\begin{cases} \frac{1}{x} & \text{if } x<0 \\ \sqrt{x} & \text{if } x\geq 0 \end{cases}$

b) $f(x)=\begin{cases} -3-x & \text{if } x\leq 0 \\ 1 & \text{if } 0<x<1 \\ x^2 & \text{if } x\geq 1 \end{cases}$





show table of values for piecewise?